PLAN OF STUDY

STEELCOTE FACILITY
ST. LOUIS, MISSOURI

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March 20, 1992

Z-301

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1.0 INTRODUCTION

1.1 Purpose & Content

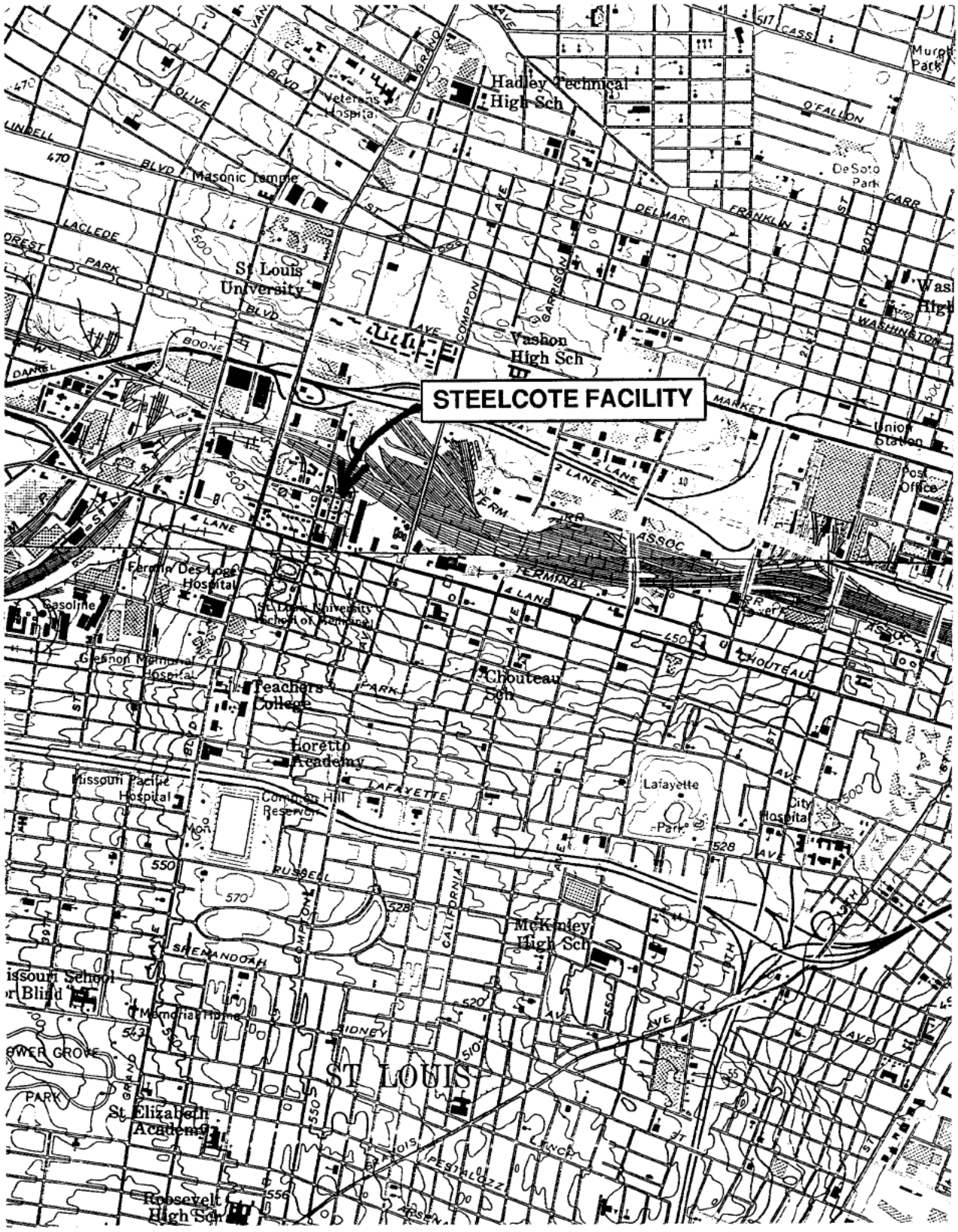
This Proposal, or Plan of Study, is being submitted by Steelcote Manufacturing Company ("Steelcote") to the United States Environmental Protection Agency, Region VII ("USEPA"), pursuant to an Administrative Order on Consent, Docket No. VII-91-H-0025 ("AOC"), a copy of which is attached as Attachment 1. The purpose of this Plan of Study is to characterize Steelcote's facility (the "site") as required by Paragraph 26 of the AOC.

This Plan of Study contains a description of the site, its location and history of land use, a description of the hazardous waste concerns, a detailed presentation of the proposed scope of work based on existing information, and a schedule for completing that work. Attached to this Plan of Study, in addition to the Consent Order, are detailed technical procedures to be used in the field work, specification packages for vendors, including drillers, analytical laboratories and the Quality Assurance/Quality Control and Hazard Assessment and Safety Plans.

1.2 Facility and Operations Description and History

The site is relatively small, located along the south side of Mill Creek Valley and bounded by Gratiot, Steelcote Square, Papin and the Missouri Pacific Railroad Right of Way. The site location is indicated in the map provided in Figure 1 and the layout of the site is shown in Figure 2. Figure 3 is an aerial photograph which presents the site and the surrounding area. As is readily apparent, the site is surrounded by property used for rail truck transport, material storage, commercial and industrial purposes.

Site development for current operations began in the early 1920's. In 1922, construction started on the varnish plant at the corner of Gratiot and Edwin Streets (now known as Steelcote Square). Buildings were constructed to house varnish cookers, a boiler, storage tanks for raw materials and finished varnish, varnish reducing tanks and an office. The products made were varnishes based on naturally occurring products, including tung, linseed, and soya oils. Later, Steelcote installed a small 500-gallon reactor to manufacture alkyd resins for in-house use. This building suffered a fire in the reactor in about 1970, and production was stopped at that time.



SOURCE: U.S.G.S. 7.5 min. QUADRANGLES
GRANITE CITY AND CAHOKIA, DATED 1954

NORTH

SCALE: 1"=2000'

SITE LOCATION

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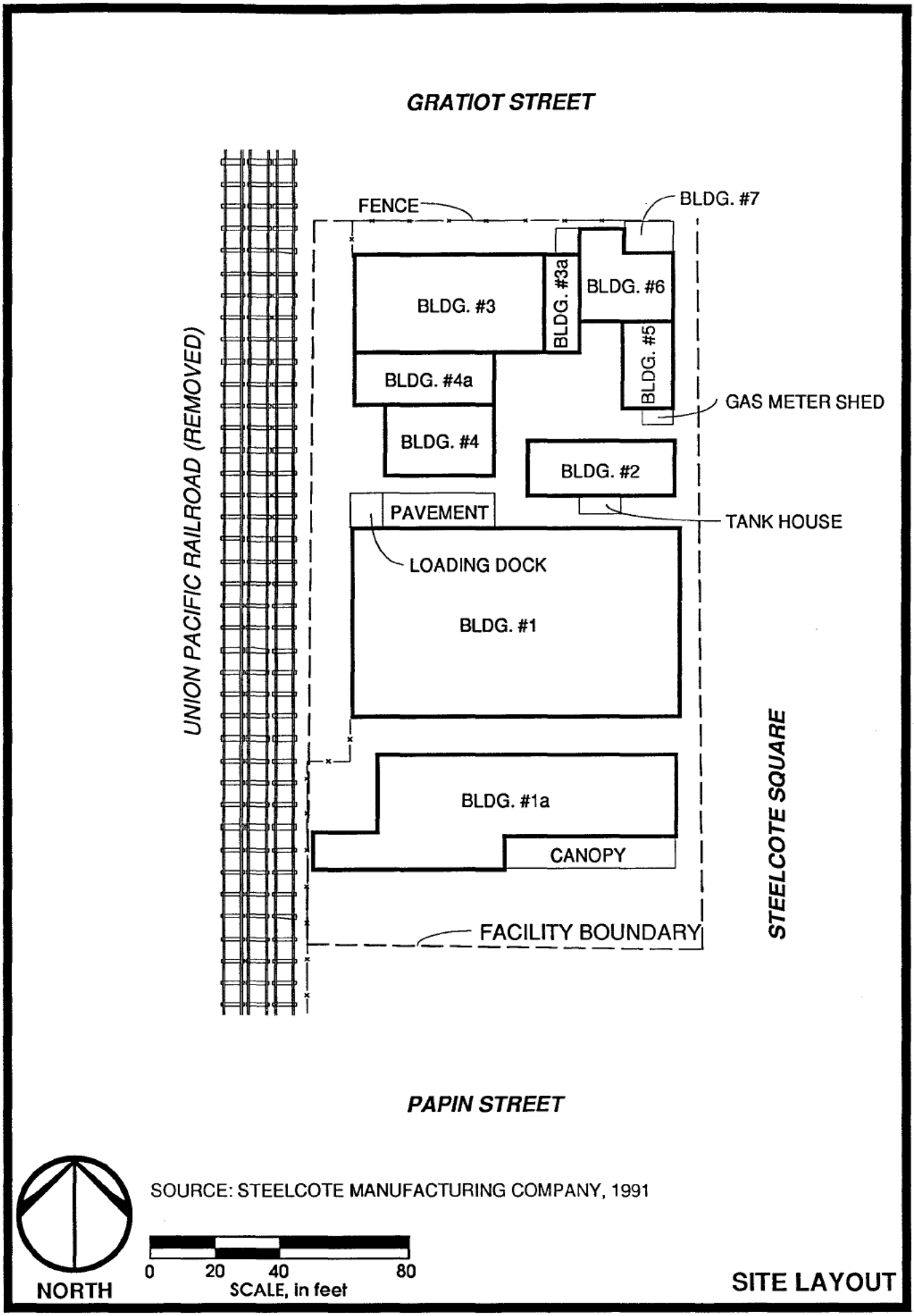
FIGURE 1



STEELCOTE FACILITY

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FIGURE 2

1. NATIONAL ENGINE
2. AMERICAN ENGINE
3. CAN MAN
4. WILKES DIRECT MAIL
5. GENERAL CONTRACTORS, INC.
6. COMMERCIAL MOBILE CLEANING
7. TECH MFG., INC.
8. MOZEL, INC.
9. CORRIGAN CONTRACTOR
10. SIMCO
11. JULIUS SEIDEL & CO.
12. BAKERS COOP/GROCERS WAREHOUSE

SOURCE: SURDEX, INC. 1991

NORTH

SCALE: 1"=200'

AERIAL PHOTOGRAPH

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FIGURE 3

In 1924, construction started on the first part of Steelcote's factory at 1 Steelcote Square, immediately south of the varnish plant. The first phase included three floors and a basement. In 1934, two more floors were added to give the plant its present configuration.

In the 1960's, the property south (steel shed) of the Steelcote plant was purchased. Steelcote used the storage shed and the north portion of the courtyard south of the storage shed for packaged raw materials. Empty drums were stored outside the shed prior to pick up for return or recycling.

Also, two Missouri Pacific Railroad spurs ran through the property. One ran along the east side of the warehouse and was never used by Steelcote, but was used by Grocers Warehouse Building, south of the Steelcote warehouse, for incoming food products, and was subsequently used by other owners. These tracks were all removed in 1989-1990 by Union Pacific Railroad, which bought out Missouri Pacific Railroad. The other spur ran just west of the varnish plant and main factory. A section of this line was used by Steelcote to off-load tank cars of solvents and vegetable oils, e.g. linseed, soya, and tung, to the on-site storage tanks.

Steelcote started at its present site, making asphalt roof coatings, putties, caulks, and enamels from natural raw materials. In 1926, Steelcote started using natural rubber in its enamels as a plasticizer. In 1938, Damp-Tex Enamel was introduced as a wet surface, mold and mildew resistant enamel.

In the 1950's, plastic resins became available and Steelcote started to use vinyl latex, polyamide epoxies, and polysulfide sealants. In the 1960's and 1970's, Steelcote utilized 100 percent solids type epoxy mastics, moisture cured urethanes, two part polyurethanes, polyamide water-borne epoxies, 100 percent solids flooring compounds, and 100 percent solids, low temperature epoxies.

In recent years and currently, Steelcote manufactures a wide range of Low VOC and water-borne epoxies, (to comply with more recently established air emission standards set by other states), alkyd based wet surface enamels, single component (moisture-cured) and two-part polyurethanes, polysulfide sealants, 100 percent solids epoxy linings for tanks and containment areas, and 100 percent solids epoxy flooring compounds. Steelcote's use of solvents has dropped considerably with the current trend of manufacturing environmentally compliant coatings.

The site currently is almost completely covered with buildings. As is indicated on the layout, approximately eighty percent of the areal extent of the site is occupied either by buildings or concrete paving. A description of the buildings follow:

Building 1

Building 1 is a five-story building which includes a basement used for hazardous waste storage and provides filling access for mixers present on the first floor. The first floor consists of mixers, three-500-gallon process tanks, and is also used for raw material storage and satellite storage for hazardous waste. The second floor houses the Quality Assurance/Quality Control Laboratory and is used for labeling and packaging. Note that no printing is performed at the site. The third floor houses ball mills for grinding of pigments and three reduction tanks. It should be noted that the reduction tanks are emptied through the second floor. Operations on the fourth floor include grinding, mixing, solvent blending and drying. The solvent blending operation consists of two small 100-gallon tanks. Drying operations employ a drying oven which consists of a 15 x 25 foot room heated with a water jacket and which is used for drying powders which are used in moisture cured urethanes. The fifth floor houses a research and development lab and is also used as a mixing area. In addition, there are two penthouses on this building. The penthouse located on the east side is a paint spray booth and on the west side are 40 tanks containing approximately 100 gallons each used for gravity feed to various operations within the building. The contents of these tanks include raw vegetable oil, refined vegetable oil, naphtha, toluene, xylene, oleum and Hi-sol.

Building 1A

Building 1A is a raised tin shed which originally belonged to the Columbia Oil Company and is now used for raw material storage including dry materials, resins, and solvents in drums.

Building 2

Building 2 use to house several operations. From east to west the building consists of a small office; two empty rooms used for storage; and, an area which houses a valve control for storage tanks.

Building 3

Building 3 is used for storage of vegetable oils and varnishes that apparently are product. At one time, it housed tanks which have since been removed and materials are now contained in 55-gallon drums. Materials from these drums are apparently raw product that are presently being analyzed to confirm this. This operation was closed in 1971. An inert gas generator (nitrogen) in the form of a vertical tank is present along the outside of the north wall of Building #3. This generator has never been used.

Building 3A

Adjacent to Building 3 is Building 3A in which there is an operating boiler that is fired by natural gas.

Building 4

Building 4 is actually a stone and reinforced concrete platform on which there are located six 10,000-gallon above ground tanks, two of which are still in use. These tanks have been used for storage of fuel oil, Hi-sol, soya oil, xylene, toluene, and oleum. Buried underneath these six vertical tanks is an 8,000-gallon tank that had been used for storage of tung oil. This tank is still present, but no longer in use. There are three 2000-gallon above ground horizontal tanks along the south side of Building #4 and one such tank on the north side of Building #4. These tanks are operable and are used to store xylene, Hi-sol and butanol.

Building 4A

Immediately north of building 4, shown as Building 4A on the layout, is an 8000-gallon tank used for Hi-sol storage which was removed in 1991. East of building 4A and south of building 3A is a buried tank which was used for storage of bunker (#6) oil. The capacity of the tank is reported to be 15,000-gallons. Note that this tank may be smaller than reported and the actual size needs to be determined.

Building 5

Building 5 is presently used for hazardous waste storage. Previously, the building was used for sandblasting. In addition, there is a compressor present in the building and attached to the south side of the building is a gas meter shed.

Building 6

Building 6 houses a varnish distillation reactor which is no longer in use. Within this building there are three burners with stacks previously used for cooking varnish. This operation which is no longer in service was fueled by fuel oil.

Building 7

Building 7 is a varnish reducing unit which is no longer in service.

As previously mentioned, and as is reflected in Figure 3, the area surrounding the Steelcote facility is highly industrialized. In fact, the Mill Creek Valley was one of the first areas industrialized within St. Louis and has a history of industrial development which predates the Civil War. The Steelcote site, prior to the establishment of the company, has been occupied by a number of operations, including a railroad line and a stock yard.

The development of Mill Creek Valley has included establishment of railroad lines parallel to the creek and the creek has been realigned as necessary to accommodate industrial development. At the present time, site drainage is accomplished by storm sewers which are located beneath and adjacent to the railroad lines and by ditches which parallel the railroad lines. The area has been subject to grading and placement fill. Much of the fill placed at Mill Creek has been of industrial origin, including power plant ash, demolition debris and waste products.

1.3 Site Drainage

Surface drainage in the area reflects surface contours and flows northeast across the site. Surface water is drained by the Metropolitan Sewer District System and hydraulic over loading results in the pooling of surface water along Mill Creek and includes back water, some of which results from hydraulic discharge from storm sewers at the Steelcote facility.

Large portions of the surface at the facility are either paved or occupied by buildings. Surface materials that are exposed consist of fill, underlain by glacial deposits, residual soil and Mississippi-age limestone. Depth to bedrock in this area is on the order of 40 feet. However, this can vary significantly because of the irregular erosional surface of the bedrock and the fact that the site is located near the upstream limits of Chouteau's Pond, which was drained prior to the Civil War. In addition, there may be sink holes present along Mill Creek, in addition to clay and construction stone quarries. These material works were common along the Mill Creek

Valley prior to and just after the Civil War and some of the locations of such works, which have since been backfilled, are not documented.

The uppermost aquifer in the area consists of the unconsolidated sediments along Mill Creek. Ground water drainage is closely related to surface drainage relative to direction of flow and ground water elevations. As can be expected in such situations, water elevations fluctuate in response to local precipitation and runoff events. Ground water can be expected to be encountered within 25-feet of the surface at the facility. However, given the nature of the unconsolidated materials, it is likely that perched water systems are present above the static water table.

1.4 Hazardous Waste Concerns

Hazardous waste concerns at the site are the result of the presence and use of various chemicals which are referred to in this document as contaminants of concern (COCs). The COCs which are listed in Table 1, were developed by reviewing records made available by Steelcote and comparing such information to hazardous waste lists as defined by 40 CFR Part 261. The facility description in combination with the COCs indicates that there may be discrete sources within the facility. However, given the relatively small size of the site, which is little more than one-half acre, the facility will be initially treated as a single source. Identification of multiple sources to be treated individually may be developed as information on the site is obtained and evaluated.

Because of this situation, our approach to site investigation will be to initially place one upgradient and three downgradient wells around the perimeter of the site and to analyze both soil and ground water samples obtained during the construction and monitoring of the ground water wells. If contaminants which exceed background levels and are above regulatory concern are detected in either type of sample, ground water flow direction along with the known history of operations at the site will be used in an attempt to locate specific origins of contamination. In order to successfully do this, a subsequent phase of soil boring and sampling and additional ground water monitoring wells may be necessary, the reasons for which are discussed in Section 2.0, Scope of Work.

TABLE 1

STEELCOTE LISTED SUBSTANCES

List Name	Synonyms	CAS #
Xylene	Dimethylbenzene; xylol	1330-20-7
Ethyl Acetate	Acetic acid ethyl ester	141-78-6
1-Butanol	Butyl alcohol:propyl carbinol	71-36-3
Methyl Ethyl Ketone	2-Butanone; MEK; Ethyl Methyl Ketone	78-93-3
Barium Sulfate		7727-43-7
Toluene	Methyl Benzene;Toluol; Phenylmethane;Methacide	108-88-3
Methyl Isobutyl Ketone	MIBK	108-10-1
Butyl Benzyl Phthalate	1,2-Benzenedicarboxylic acid, butyl phenyl methyl ester	85-68-7
Basic Lead Silico Chromate		11113-70-5
Lead		7439-92-1
Dibutyl Phthalate	n-Butyl Phthalate; 1,2-Benzenedicarboxylic acid,dibutyl ester; phthalic acid dibutyl ester; DBP	84-74-2
Lead Peroxide	Lead Dioxide	1309-60-0
Lead Chromate		7758-97-6
Zinc Chromate		13530-65-9
Chromium		7440-47-3
2-Ethoxyethanol	Ethylene glycol monoethyl ether	110-80-5

List Name	Synonyms	CAS #
Cyclohexanone	Ketohexamethylene	108-94-1
Insoluble Nickel Compounds		7440-02-0
Methanol	Methyl alcohol;carbinol	67-56-1
Chromium Trioxide		1333-82-0
Barium Metaborate Monohydrate		13701-59-02
Carbon Tetrachloride	Tetrachloromethane	56-23-5
Molybdated Lead Chromate		12656-85-8
Chromium Oxide		1308-38-8
Lead Monoxide		1317-36-8
Di(2-Ethylhexyl)Phthalate	Bis(2-Ethylhexyl) Phthalate; 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester; DEHP	117-81-7
Phenol		108-95-2
Lead-Sulfo-Chromate		51899-02-6
Barium-Insoluble Compounds		7440-39-3
2-Methyl-1-propanol	Isobutyl Alcohol; Isobutanol; IBA; Isobutyl carbinol	78-83-1
Nickel Compounds		12607-70-4
Formaldehyde	Gas: Methyl Aldehyde; Methanal Solid: Formalin; Formol	50-00-0
Toluene-2,4-Diisocyanate	TDI	584-84-9

List Name	Synonyms	CAS #
Benzene	Benzol; Phene; Cyclohexatriene	71-43-2
Cadmium		7440-43-9
Methylene Chloride	Dichloromethane	75-09-2
Nitrosoimino Diethanol	N-Nitrosodiethanolamine: 2,2'-(Nitrosoimino)-bisethanol 2,2'-nitrosoiminodiethanol	1116-54-7
Epichlorohydrin	Chloromethyloxirane; dl-α-epichlorohydrin; 1-chloro-2,3-epoxypropane	106-89-8
Bisphenol A/Epichlorohydrin		25068-38-0
Cumene	(1-Methylethyl)benzene;cumol	98-82-8
Naphthalene		91-20-3

2.0 SCOPE OF WORK

2.1 Pre-Field Work

Pre-field work will consist of subcontractor selection, set-up of a decontamination unit, and mobilization of equipment to the site. Note that no on-site activities will be authorized prior to approval of this work plan by the U.S.E.P.A. and satisfaction of training and medical surveillance requirements for any and all individuals conducting this work.

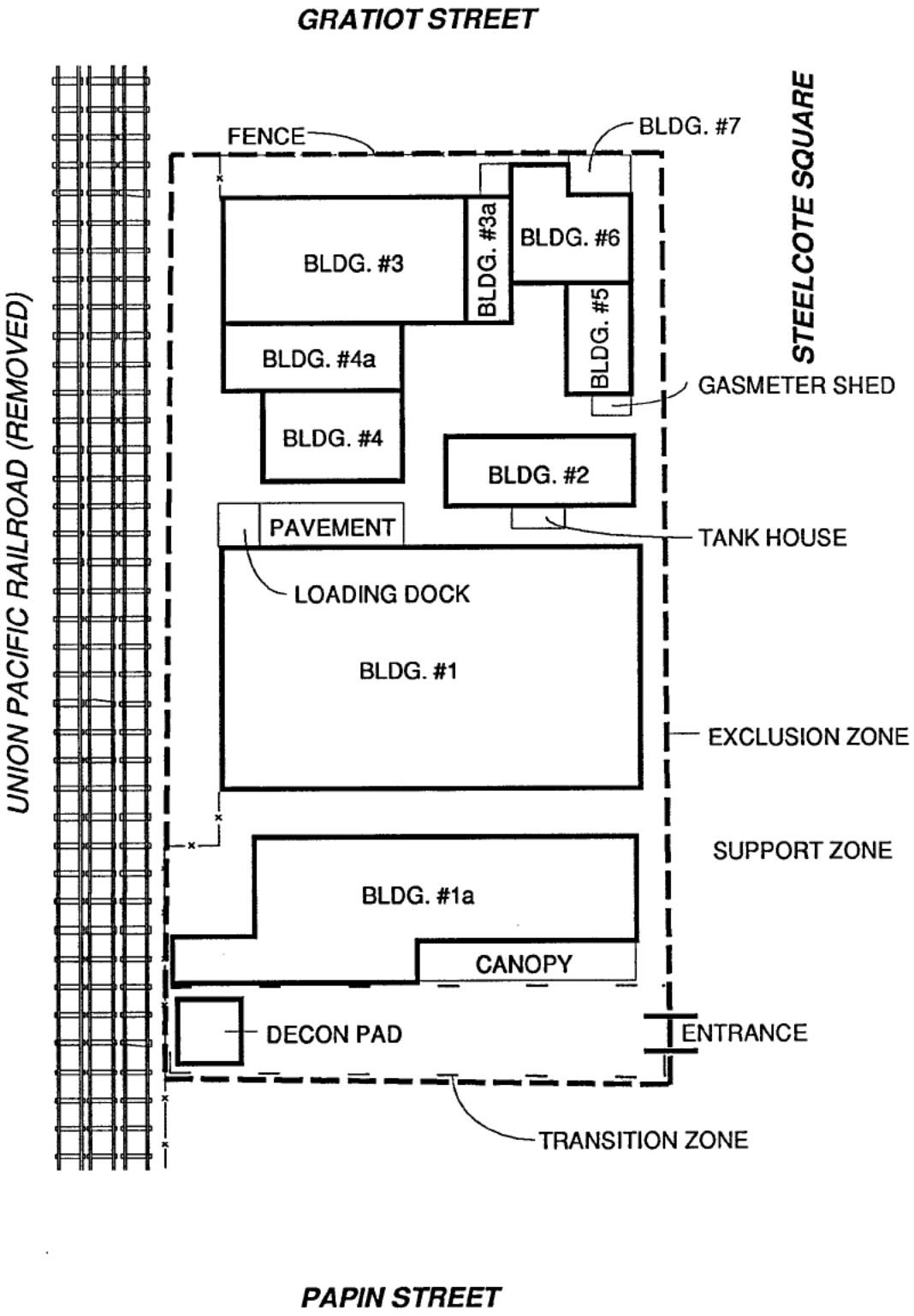
Contractor selection will consist of selecting qualified laboratories and drilling contractors to perform work on the site and to analyze both soil and ground water samples. Bid specifications sheets for this work are attached to this Plan of Study. Note that subcontractors will all be contracted directly to Steelcote Manufacturing Company and the work will be overseen and coordinated through Shannon & Wilson, Inc.

Work zones and a combined personnel and equipment decontamination unit will be set up as is shown in Figure 4. Both exclusion and transition zones are depicted in this Figure. It should also be noted that, because of spatial restrictions, the transition zone is actually located near the proposed upgradient monitoring well. In addition, downgradient monitoring wells will be located in public right of ways. For this reason, the areas around the wells will have to be roped off and considered part of the exclusion zone during the construction and development of the wells. All wells will be recessed and secured with pad locks.

All equipment and personnel leaving the exclusion zones will have to be decontaminated as specified in the attached Hazard Assessment & Safety Plan (HASP) within the transition zone prior to leaving the site. The transition zone will have facilities for steam cleaning equipment and for doning and doffing personal protective equipment and hand and face washing for personnel.

In addition to decontamination for health and safety purposes, the transition unit will also be used for decontaminating sampling equipment prior to and after each use for a given soil boring or well as is described in later sections of this plan of study.

After the decontamination units are set up and are operable, mobilization to the site will begin. Mobilization will include transportation and installation of all required sampling equipment and personnel at the site.



SOURCE: STEELCOTE MANUFACTURING COMPANY, 1991

NORTH

0 20 40 80
SCALE, in feet

DECONTAMINATION (TRANSITION ZONE) AND WORK ZONE

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FIGURE 4

2.2 Field Work - Initial Phase

The initial phase will include installation of ground water monitoring wells, soil sampling, conducting physical measurements, and sampling both ground water and surface water runoff.

Upgradient and downgradient ground water monitoring wells will be placed at four locations as shown in Figure 5. During the drilling of the wells, which will be conducted with 6 1/4 inch inside diameter hollow stem augers, a CME continuous sampler will be used to obtain a continuous soil core throughout the length of the boring. The soil core will be visually examined for both physical and chemical properties and will also be scanned with an organic vapor analyzer. Those sections of the soil core which either produce positive readings from the organic vapor analyzer or appear to have undergone chemical changes, will be selected for soils analysis. If no such indicators are present in any given core, then a composite sample of the entire core will be collected for analysis.

Soil sampling will be conducted at the proposed locations shown in Figure 5. Sampling will consist of collecting soil samples to a depth of 15 feet or interception of ground water, which ever occurs first. Sampling will be conducted in accordance with Technical Procedure 1 and the continuous sampling method will be the preferred procedure. However, if subsurface or other site conditions do not allow for implementation of the preferred method, other methods will be used. The soil samples will be visually examined for both physical and chemical properties and will also be scanned with an organic vapor analyzer. Those sections of the soil core which either produce positive readings from the organic vapor analyzer or appear to have undergone chemical changes, will be selected for soils analysis. If no such indicators are present in any given core, then a composite sample of the entire soil boring will be collected for analysis.

In addition, during the advancement of the soil boring, physical changes will be noted and samples collected from that interval for physical testing in order to help determine aquifer characteristics. At least one sample for physical testing will be collected from each soil boring which is converted into a ground water monitoring well.

Soil borings and well construction and installation will be conducted in accordance with the following technical procedures, which are attached to this Plan of Study.

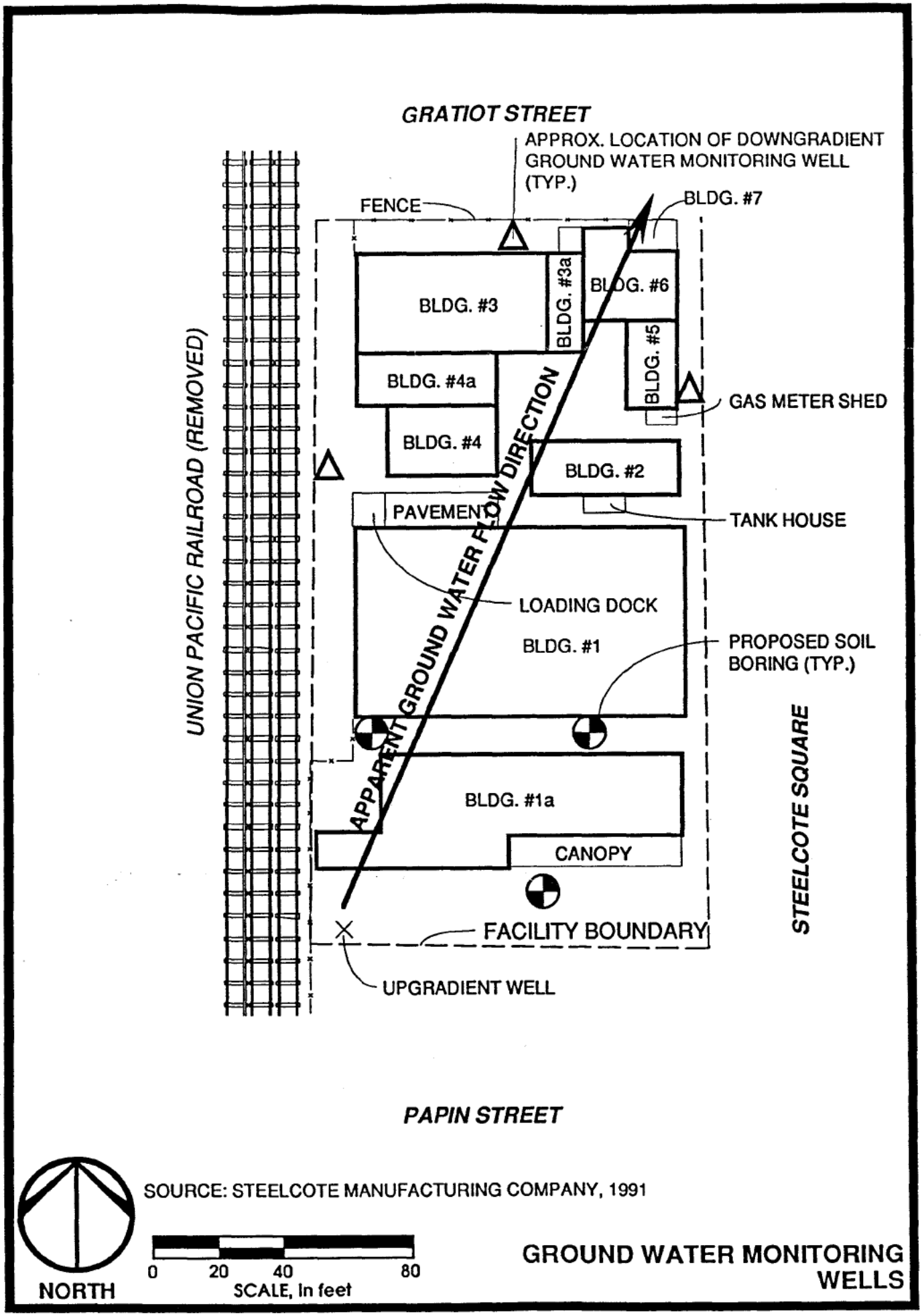

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FIGURE 5

1. Soil borings/rock coring and sampling procedure
2. Monitoring Well Design and Installation
3. Monitoring Well Development

Note that all soil cuttings will be contained within 55-gallon steel drums until chemical analyses of the soils are completed. At that time, appropriate disposal will be arranged. It is proposed that the 90-day Resource Conservation and Recovery Act (RCRA) storage requirements interval will be initiated when the results of the chemical analyses have been obtained.

Well construction specifics are presented in both the Technical Procedures as well as the QA/QC Plan. The wells will be screened from bedrock to approximately five feet above the ground water elevation encountered at the time of installation. This will allow equilibration of anomalous conditions which may result from penetrating perched water tables. In addition, it will allow for sampling of materials which are soluble and those insoluble fractions with specific densities greater or less than that of water.

Physical measurements at the site will include surveying and hydrologic testing. Level surveying of the wells, including the top of the well and water levels of the upgradient and downgradient wells will be conducted to the nearest 100th of a foot vertically and the nearest one half foot horizontally. This survey will be tied in to the nearest benchmark. Water elevations will be recorded for each hydrologic testing period and sampling period by measurement with an electric tape from the top of the well.

At least three days after the development of the wells has passed, the wells will be subjected to field permeability testing by one of the procedures indicated in Technical Procedure No. 5 as appropriate. It is proposed that the slug test method be used to determine permeability of the formation. The effectiveness of the technique will be assessed after the first test to determine whether a different technique might yield better data. If the preferred method is not considered appropriate, either Ms. Cynthia Hutchison or Mr. Mike Collins with USEPA will be contacted for approval to implement a different method.

Ground water sampling will be initiated and conducted on a quarterly basis with the first quarter sampling occurring at least three days after the completion of the hydrologic testing. Ground water sampling will be conducted in accordance with Technical Procedure No. 4, Collection of Ground Water and Leachate Samples. Note that development and purge waters

will be contained in 55-gallon drums until analyses of the ground water samples are available. At that time, disposal will be made as appropriate. It is proposed that the 90-day RCRA storage time interval be initiated after receipt of the results of the chemical analyses.

Surface water runoff at the site will also be collected. In addition, hydrologic monitoring will also be done. Because of the location of the site at the lower end of a storm sewer line, backwash due to hydraulic loading of sewers is common during storm events. Because of this and the relatively flat topography at the site, and structural controls such as ditches and roof wash collection, analysis of topographic maps is probably not adequate to determine the routing of the flow. To accommodate this situation, several storm events will be observed in order to help determine flow characteristics and potential variations due to the factors noted. These observations will be used to help determine storm water routing and in combination with rain gauges will be used to estimate the volume and routing of runoff relative to precipitation events at the site. Once this information is determined, arrangements will be made to collect one upgradient and three downgradient grab samples. Collection of such samples will be in accordance with Technical Procedure No. 7, Surface Water Sample Collection. Sample preservation for both surface and ground water samples will be in accordance with Technical Procedure No. 6, Sample Preservation.

2.3 Field Work/Subsequent Phases

It may be necessary to conduct additional site investigation, including the making of more soil borings and the addition of ground water monitoring wells, to adequately characterize the site. Due to the relatively small size of the site and the short distance between the ground water monitoring wells, both upgradient and downgradient, it may be difficult to determine ground water flow and gradient as the ground water table is expected to be relatively flat in this area. For this reason, it may be necessary to locate one or two additional wells, outside the boundaries of the site at a distance sufficient to detect a ground water gradient. If it becomes apparent that this is necessary, an addendum to that effect will be developed for this Plan of Study.

If contaminants in excess of background levels are detected at downgradient wells, the history of the site in combination with the delineated flow path between the upgradient and the specific downgradient wells in which contaminants were detected will be used to help identify

potential on-site sources of contamination. To facilitate this investigation, an addendum to this Plan of Study for additional investigation will be prepared and submitted to the USEPA via the client for approval.

Quarterly ground water sampling and analyses will be conducted for a period of one year. In addition, water level measurements will be taken prior to purging the well for each sampling event. Quarterly analyses will be statistically compared relative to results from the upgradient well as well as results from previous quarters.

2.4 Physical Laboratory Analyses

The purpose of the physical laboratory analyses is to provide aquifer characteristic information in order to determine the rate and direction of flow and whether or not there might be any flow preference within the vertical section of the aquifer. In addition, the physical laboratory analyses, which will include grain size analyses, permeability and Atterberg limits (one point), will be useful in the design of any remediation, if any is necessary.

2.5 Analytical Laboratory Analyses

Analytical laboratory analyses will, at least initially, include analyses of soil and ground water for any of the COCs listed on Table 1. It is anticipated that this list may be modified on the basis of analyses of ground water monitoring and soil samples obtained from the installation of the ground water monitoring wells.

2.6 Data Analyses and Reports

Three types of reports will result from data obtained during the field investigation. These include amendments to this Plan of Study, characterization reports and management reports.

It is anticipated that amendments to this Plan of Study may be necessary for several reasons which include, but may not be limited to, the following:

1. Requirements for additional ground water monitoring wells to determine ground water gradient and flow direction.
2. Additional soil samples which may be necessary to help isolate potential sources of contamination.

3. Modifications to the list of COCs presented in Table 1 as a result of initial analyses of soil and ground water.

4. Modification in the size and shape of the area of concern.

Characterization reports will include both a draft and a final report. The draft report will be submitted to the client for his review within three months after the initial quarterly monitoring of ground water has been completed. The final report will be submitted within three months after the final quarterly monitoring. The reports will include characterizations of the waste materials if present, their source of origin, the host materials, including soil and ground water, and the likely fate of the contaminants within the host materials. The reports will also include recommendations relative to additional field work and/or remediation if necessary.

Management reports will include monthly status reports required by paragraph 28 of the AOC as well as any EPA notifications of field work that are required. The U.S. EPA will be given at least 15 days advance notice prior to any field activity and 20 days notice prior to disposal of any samples by Shannon & Wilson, Inc. Both notifications will be in writing.

Monthly status reports will also be developed which will consist of a description of all activities conducted in the previous month, including all technical data, such as laboratory analyses received during that month. The report will also fully describe any problems encountered during the previous month and recommendations for correcting the problems. In addition, the status report will include a description of those activities anticipated in the next month. These reports will be submitted to the client no later than the 10th calendar day of each month. This will allow the client to review and submit the appropriate portions of the status report to the USEPA by the 15th calendar day of each month.

3.0 MANAGEMENT

The principal in charge of this project (see Figure 6) for Shannon & Wilson, Inc. will be Mr. Donald McQueen, Vice President. Mr. McQueen will be responsible for any contractual interaction with the client and will participate in the technical direction of the project and technical analyses of the field investigation.

Mr. Larry Rosen will serve as a field manager and will be responsible for day to day operations during the field investigation. He will also participate in the technical evaluation of the information and will be responsible for the development of all reports, including the characterization and monthly status reports. Mr. Rosen will be supported by Shannon & Wilson technical staff as required and by the drilling and the analytical laboratory subcontractors.

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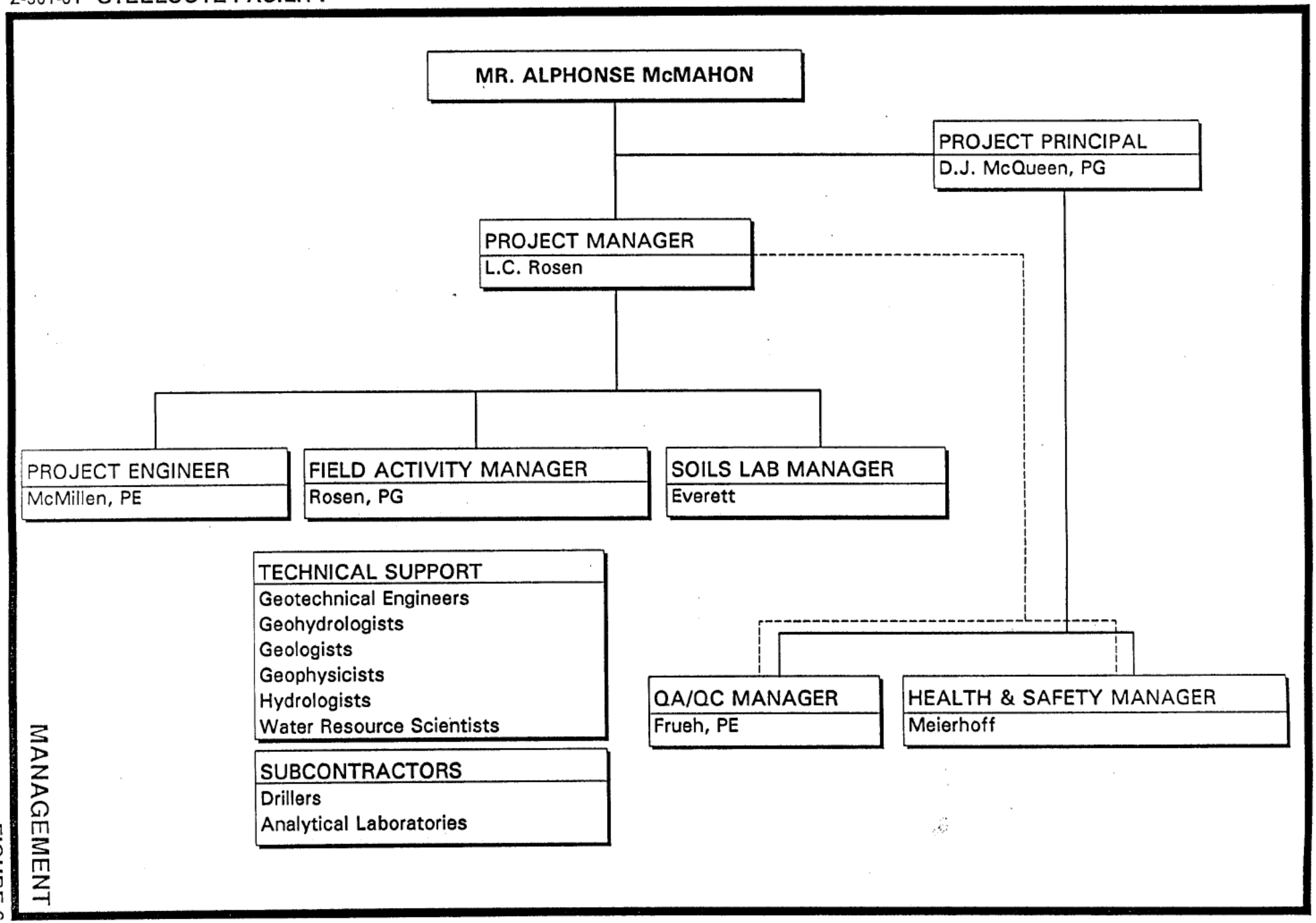

FIGURE 6

4.0 SCHEDULE

The schedule for completing the work shown in the Plan of Study is indicated in Figure 7. As can be seen in the figure, the work is to be completed within 15 months and consists of three sets of activity: prefield work, field work, and data analyses and reports.

Prefield work will include contractor selection (driller and analytical laboratory), construction of the decontamination unit, and mobilization of all equipment to the site necessary to conduct the field work. Mobilization will be an ongoing activity to be performed as people and equipment are needed. The prefield work will be completed within the first month.

Field work will take place over a period of approximately one year. The largest portion of the field work will include the installation and development of monitoring wells, conducting hydrological testing of the wells, making physical measurements such as water level recordings, conducting laboratory analyses for chemical and physical properties of soils collected during construction of the wells, and conducting quarterly sampling and analyses of groundwater samples from the wells. With the exception of the quarterly sampling and analyses, this work should be completed by the end of the third month. Quarterly sampling and analyses, which will commence after the second month, will be conducted every three months and the final sample and analyses event will be completed by the end of the 12th month.

The information derived from the field work described in the first paragraph may indicate that additional subsurface investigation is necessary. One to two months after completion of the above described work will be necessary to develop specifications for this additional work which would then be scheduled for completion over a period of approximately three months.

In addition to the subsurface field work, surface water monitoring sampling and analyses will also be conducted. As described in the Plan of Study, surface water run off will be visually monitored for at least two precipitation events which will hopefully occur during the two months scheduled for such activities. The following month, surface water would be sampled and analyzed from sample locations to be determined during the monitoring period. Note that the schedule for surface water monitoring, sampling, and analyses is not a critical path event and the schedule could "float" for a period of six months, without adverse effect on project completion deadlines.

Data analyses and reports and related activities would take place over the entire 15

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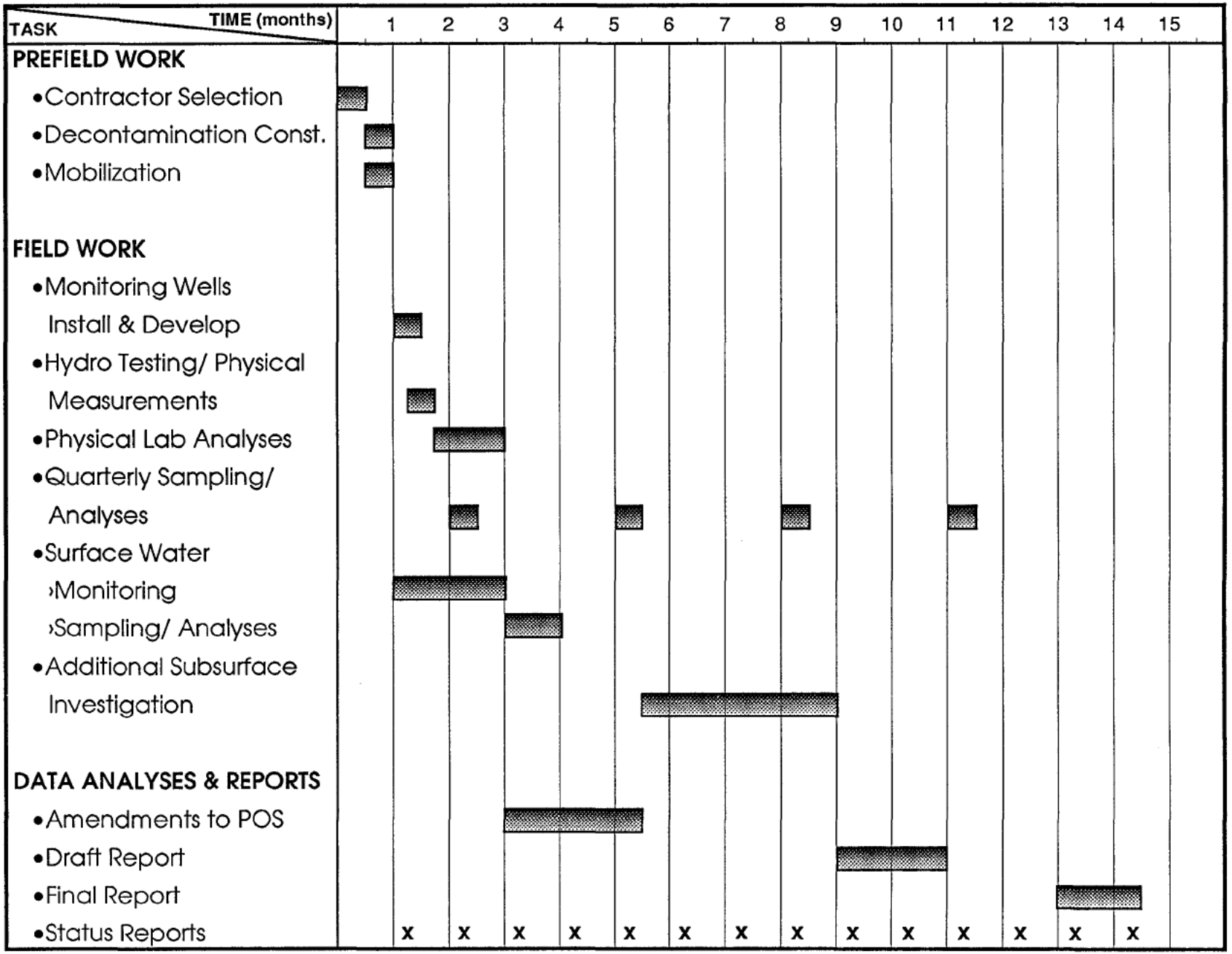

PROJECT SCHEDULE

FIGURE 7

months. It is anticipated that amendments to the Plan of Study may be in order after the initial field work is completed. These amendments, if necessary, are scheduled to be incorporated within the Plan of Study between the 3rd and 6th months. These amendments will form the basis for the additional subsurface investigations mentioned above.

The site characterization report will be done in both draft and final form. The draft form will be completed over a two-month period immediately following the completion of any additional subsurface investigations performed. This report will be submitted to the client for review and comment. A final report will be developed based upon these comments and will be submitted to the client at least two weeks prior to the end of the scheduled 15-month period for completion of all work.

Status reports will be developed and submitted to the client monthly. The client will receive these reports for each month by the 10th day of the following month in order to enable the client to include the appropriate portions of these status reports in their report to the USEPA.

TECHNICAL PROCEDURES 1

Soil Boring/Rock Coring and Sampling Procedure

Pre-drilling Activities

The drill rig head assembly, table, and tools will be decontaminated as per Technical Procedure 8 (Equipment Decontamination) prior to setting up at a sampling location (monitoring well or boring). Prior to setting up the drill rig, the site will be checked by Shannon & Wilson's site manager for utilities or other underground obstructions. Drilling will only proceed in areas apparently free of service lines. All drilling will proceed under strict compliance with the Hazard Assessment and Safety Plan.

Once the drill rig is in position, the following protocol will be followed for each monitoring well and boring:

Soil samples will be collected continuously from the auger borings beginning at the surface until the level where rock is encountered. Sampling will be done with a continuous core sampler, split-spoon sampler, or thin-walled sampler using standard sampling techniques as directed by the site manager.

Soil Drilling

Unconsolidated deposit borings will be advanced using minimum six-inch I.D., hollow-stem augers. Auger boring downhole advancement will be performed in accordance with ASTM Designation D1452 "Soil Investigation and Sampling by Auger Borings" and ASTM STP479 "Suggested Method for Soil Investigation and Sampling by Hollow-Stem Augers." Continuous soil sampling will be done using continuous soil core samples and/or standard penetration tests as directed by the field manager for the purpose of collecting a soil sample for identification purposes and for a measure of the soil resistance to penetration of the sampler. In addition, Shelby tubes may be used to obtain relatively undisturbed soil samples for laboratory determination of hydraulic conductivity.

Standard Penetration Tests will be conducted in accordance with ASTM Designation D1586 "Penetration Tests and Split Barrel Sampling of Soils." A Standard Penetration Test will be performed by driving a standard split barrel sampler 18 inches into undisturbed soil below

the bottom of the borehole, ahead of the augers, by use of a 140-pound, guided hammer or ram, free falling through a height of 30 inches. Prior to driving the split barrel sampler, all loose and foreign material will be removed from the bottom of the boring. The number of blows required to drive the sampler for three, six-inch increments, for a total of 18 inches, will be observed and recorded.

When advancing hollow-stem augers, a center plug will be used at the tip of the augers to preclude cuttings from entering the lower casing section. Borings will be advanced to a depth designated by the site manager or until refusal, i.e., greater than 50 blows per six inches of penetration. After each boring has been advanced to the desired depth and samples collected, the hole will be grouted to the surface.

Rock Coring

Rock coring may commence after refusal as directed by the site manager. The top of the weathered rock and the top of competent rock will be clearly denoted in the log record during boring advancement.

Coring will be performed through minimum six-inch I.D. augers, or temporary casing that has been driven or seated into the top of the rock. This is done to prevent seepage from the overburden into the bedrock where coring is taking place. Prior to coring, all loose and foreign material will be removed from the inside of the augers or temporary casing.

Rock coring practices will be conducted according to ASTM Designation D2113 "Diamond Core Drilling for Site Investigation." Coring will be done using an N series (NX or NWM) double tube core barrel with a diamond bit and reaming shell or NQ wire line. In soft or friable formations, an NWM double tube core barrel will be used. The drill rod will be N series, or equivalent. Rock core runs will be no longer than ten feet.

The borehole diameter must allow a minimum two-inch annular space between the boring wall and the well casing. If necessary, the boring will be reamed to the required diameter. An alternative is to install a rock well consisting of a surface casing grouted in the hole to the top of competent rock.

Immediately upon recovery of the core barrel from the boring, the rock core will be carefully removed from the barrel and placed in a core box. The core will then be scanned for

organic vapors and the values will be recorded in the rock core log. The core will then be photographed, logged by the on-site geologist, and recorded.

Drill rigs, drill rods, and other drilling and sampling tools will be free from oil and grease, and will be cleaned with live high pressure steam, washed, and rinsed with a decontaminant prior to initiating drilling and augering at each monitoring well and boring location.

The use of any liquid, including water, is to be generally avoided during drilling and only clean, potable, non-chlorinated water will be allowed for use as a drilling or coring fluid. Any request to use water, for other than rock coring, needs to be approved by the field manager. Dispersing agents (such as phosphates) or acids will not be used.

Soil Sampling

Soil samples for chemical analysis will be obtained at different locations around the site using a variety of sample tools. Continuous, split-spoon, and Shelby tube sampling techniques will be used to collect samples for geotechnical classification during drilling, for monitoring well installation and to collect samples for chemical analysis at subsurface boring locations.

Borings for subsurface sampling will be completed using conventional hollow stem auger drill methods, unless site conditions prohibit this approach.

Upon retrieval of the sampling barrel, a portion of the collected sample will be placed in a glass jar, covered with aluminum foil, and sniffed with a photoionization detection monitor (PID) with at least a 10.2 eV lamp (HNU Model ISPI 101 or equivalent) or a flame ionization detection monitor (FID) (Foxboro Model 128/GC Organic Vapor Analyzer or equivalent). Upon completion of the screening procedure, a suspect sample will be containerized and properly documented in order to be chemically analyzed.

Samples for volatiles (purgeable aromatics and halocarbons) will consist of discrete samples from each sampling. For other analyses, the remainder of the samples will be homogenized with other samples from the boring in a clean stainless steel sampling pan using a stainless steel spoon prior to being placed in sample containers.

Shipping containers will be delivered to the laboratory by either Shannon & Wilson personnel or overnight courier. Chain-of-custody documents will be shipped in air-tight plastic

bags in each container (taped to the inside of the lid) with applicable samples. The laboratory will be notified by phone of the sample shipment.

Soil samples from soil borings for geotechnical classification and analyses will be collected using Shelby tube samplers, in borings drilled with a hollow-stem auger.

The protocol for collecting soil samples for geotechnical testing with the hollow-stem auger and Shelby tube sampler will be as follows:

Hollow-stem auger from the land surface to the sampling depth. Soil samples will then be obtained with a Shelby tube push sampler. The collector will then seal the tube with wax.

Surface material samples will be collected with a small shovel or hand auger. A sufficient amount of soil to conduct laboratory permeability testing, Atterberg limits, compaction, and density determinations will be collected.

TECHNICAL PROCEDURE 2

Monitoring Well Design and Installation

Boring Diameter

The boring will be of sufficient diameter to permit at least two inches of annular space between the boring wall and all sides of the centered riser and screen. The inside diameter of the proposed monitoring wells is two inches.

Casing and Screen Materials

Casing (Riser)

All monitoring well casing (riser pipe) will consist of new, threaded, flush joint, Polyvinyl Chloride (PVC) pipe (National Sanitation Foundation Potable Water grade) with an inside diameter of two inches. The casing will conform to ASTM D 1785 Schedule 40 pipe and will bear markings that will identify the material as that which is specified. No organic solvents or glue will be used in joining the pipe.

Screen

All monitoring well screens will be ten feet in length and will be constructed of PVC material similar to the well riser. The screen will be factory constructed and of "continuous wrap" or "mill slot" design with slot openings of 0.010 inch (#10 slot). Field slotted or cut screen is not permitted. The field manager will verify that the slot openings are compatible with the aquifer and gravel pack material. If a #10 slot is not compatible, an alternate screen size may be specified. Screen and riser sections will be joined by threaded, flush-joint couplings, to form watertight unions, that retain 100 percent of the strength of the screen. The bottom of the deepest screen or casing section will be sealed with a threaded cap or plug of inert, non-corroding material similar in composition to the screen itself.

Centralizers

All risers and screens will be set round, plumb, and true to line. Centralizers will be used as needed to assure plumbness and alignment of the wells in boreholes where the hollow-stem augers or casing can be removed prior to well placement. Centralizers will not be installed on the well screen. Field observations will be made to assure that the riser casing is not touching or resting against the sides of the boreholes prior to grout placement.

Gravel Pack

Clean, washed, inert, noncarbonate materials will be used to construct a uniform and continuous gravel pack designed to prevent migration of fines into the screen. It is anticipated that an artificial sand material such as a No. 1 or No. 0 washed silica sand (graded between No. 12 and No. 40 sieves) will be installed in the annulus between the boring and the well screen. A minimum of one foot of the material will be placed in the bottom of the boring below the base of the well screen. The gravel pack shall be placed by tremie pipe from the bottom of the boring to approximately two feet above the top of the well screen.

Bentonite Seal and Grout

A minimum two-foot thick seal, consisting of tamped bentonite pellets or bentonite slurry will be placed into the annular space between the riser and boring wall at the top of the gravel pack. The bentonite seal will be lightly wetted every ten minutes for thirty minutes and will be allowed at least one hour hydration time prior to placement of grout. Grouting can be conducted after bentonite pellets have formed an adequate seal to prevent grout from infiltrating into the filter pack. Hollow stem augers or appropriate casing may be left in the borehole during this period to prevent borehole wall sloughing. Non-shrinking cement grout will then be placed into the annular space using a tremie pipe with side discharge from the top of the bentonite seal to the ground surface. The cement grout will consist of a mixture of portland cement (ASTM C 150) and water in the proportion of not more than seven gallons of clean water per bag of cement (one cubic foot or 94 pounds). Additionally, three percent by weight of bentonite powder will be added to the mixture to help reduce shrinkage.

Quantities of cement and bentonite will be noted on the well construction log. A tremie

pipe will be used for the placement of grout. The tremie pipe will be plugged at the bottom and perforated or slotted on the sides to in order to avoid disturbance of the bentonite seal.

Protection

Upon completion of the monitoring well, a suitable vented cap will be installed to prevent material from entering the monitoring well. For above ground completions, a round or square, steel protective casing or security cover will be installed over the PVC pipe stick-up. It is anticipated that in above-ground completions, the PVC pipe will extend above the ground approximately 20 to 24 inches and that the security cover will extend above the ground approximately 24 to 36 inches. The security cover will have a hinged, locking cap. There will be no openings in the security cover below its top. The diameter of the security cover will allow easy access to the PVC pipe stick-up.

Flush or below grade completions will be installed with a traffic box or equivalent lockable security cover. There will be no openings in the security cover below its top. The diameter of the security cover will allow easy access to the PVC pipe stick-up.

A minimum three-foot square, four-inch thick concrete pad, sloped away from the monitoring well, will be constructed around the security cover at the final ground level elevation. The ground immediately surrounding the top of the well will be sloped away from the well to aid in surface runoff.

TECHNICAL PROCEDURE 3

Monitoring Well Development

The development of the monitoring wells will be performed as soon as possible after installation, but no sooner than 48 hours after grouting is completed. Development protocol will be as follows:

(a) measure static water level

(b) surge the well with a single surge block raised and lowered slowly throughout the screened interval for a total period of one-half to one hour.

(c) remove a minimum of all or five monitoring well casing volumes by pumping with an oil-free compressor or bailer. Each new monitoring well completed will be equipped with a dedicated bailer.

(d) collect water sample initially and at the end of development and perform field measurements of water level, specific conductance, pH, and temperature.

(e) continue development until ground water removed from the well is free of sand and drilling fluids. No water or other liquid will be introduced into the well other than formation water from that well.

TECHNICAL PROCEDURE 4

Collection of Ground Water and Leachate Samples from Monitor Wells

Ground water samples will be obtained with a PVC bailer. Cleaning will be performed in the field between samples in accordance with recommended EPA procedures.

Cleaning shall consist of: (1) removing gross contamination using scrapers and washing with a brush in a bucket filled with a tri-sodium soap solution, (2) rinsing in a second bucket containing tap water and a brush, (3) spraying with methanol, (4) rinsing with deionized water, and (5) air drying.

A clean plastic sheet will be placed on the ground around the well during sampling to minimize the potential for contaminating the ground water sampling equipment. This sheeting and other material generated during sampling will be contained for disposal.

The sampling protocol at the site will conform to the "Sample Handling Protocol for Low, Medium, and High Concentration Samples of Hazardous Waste," USACE, 10/86 and will be as follows:

1. Measure Water Level - Using a clean electronic tape, determine the water level in the well and calculate the fluid volume in the casing and screen.
2. Purge Well - Remove all or at least five well volumes by bailing. Water removed from ground water monitoring wells will be contained in 55-gallon drums until analyses of the ground water samples are available. At that time, disposal will be made as appropriate.
3. Collect Sample - Collect sample using a bailer by lowering the bailer into the well until bailer is full. Remove slowly and pour into sample jars so that no air bubbles are present in the sample jar.

TECHNICAL PROCEDURE 5

Field Permeability Testing

1.0 PURPOSE

This procedure describes the methods for conducting field permeability tests on water-bearing zones and aquifers utilizing either Slug Test methodology or pressure transducer data and an electronic data logger. The Slug Test methodology is the preferred approach and will be utilized unless it is determined that a different method would yield better data. The procedure includes data collection and reduction techniques.

2.0 APPLICABILITY

This procedure applies to the permeability testing of properly developed, small diameter wells identified as useful in characterizing formation permeability conditions. The well/piezometer does not have to fully penetrate the aquifer for this method to yield meaningful data.

3.0 DEFINITIONS

- Aquifer: A formation, group of formations, or part of a formation or water-bearing zone that contains sufficient saturated and permeable material to yield water to wells or springs.
- Bailer: Device used to withdraw water from a small diameter well or piezometer. A bailer typically is a piece of pipe attached to a line and having a check valve in the bottom.
- Data Logger: (see HERMIT)
- Head: Energy contained in a water mass, produced by elevation, pressure, or velocity.
- HERMIT: Electronic data logger designed to record and store pressure transducer input as a function of time. Manufactured by In-Situ of Laramie, WY.
- Pneumatic: Of, relating to, or using air, wind, or other gas.
- Pressure Transducer: Device which converts the pressure exerted upon the

transducer to an electronic measurement of an equivalent height of a column of water.

- Slug: Device or means used to induce the water column in a well or piezometer to rise when rapidly lowered into the well and submerging it below the static water level (or conversely induce a lowering of the water column by rapid removal above the static water level). A slug is typically a solid piece of metal or a volume of water equivalent to the volume of the slug. A bailer may be used to remove a slug of water.
- Static Water Level: The level of water in a well that is not being affected by withdrawal or influx of ground water.
- Well Head: Structure fitted to the top of well casing.

4.0 DISCUSSION

The possibility of encountering low-permeability materials in a field investigation may require an alternative method for evaluating aquifer characteristics. The use of a Slug Test is often chosen in those situations when the soil materials have a conductivity which is too small to conduct a pump test. This method involves either withdrawing or injecting a slug of water of known volume into the well and provides an order-of-magnitude result for hydraulic conductivity. The rate at which the water level rises or falls will be dependent on the formation characteristics. Note that other terms which may be used for this type of testing include a bail-down test. This terminology is used if a bailer is used to remove a volume of water from the well. Interpretation of the collected data is accomplished following techniques formulated by Bouwer and Rice (1976), Cooper et. al. (1967), Hvorslev (1951), Nguyen and Pinder (1984), Lohman (1975), Papadopulos et. al. (1973), or Ramey, et. al. (1975). The assumptions in these techniques vary such that some understanding of the aquifer/formation characteristics and the type of well installed will aid in the selection of data reduction which will provide a more reasonable estimate of the hydraulic conductivity.

The methodology is dependent on the placement of the well screen. If the well screen extends into the unsaturated zone above the water table, then only the slug withdrawal techniques are applicable.

For small diameter wells (less than 4-inch), injection of a known volume of water into the well as rapidly as possible can be accomplished by one person with a bucket and water levels monitored with an electronic water level indicator.

Prior to the injection of the slug, the static water level is measured using the water level indicator and recorded. The slug is introduced into the well as rapidly as possible and the water level is measured immediately after injection (time zero or t_0). As with other aquifer tests, the rate of water level recovery decreases logarithmically, therefore measurements of the water level should be made rapidly at first. Measurements are taken less rapidly as time progresses and tests should be run until approximately 85 to 90% recovery is completed. Since recovery is a logarithmic function, the time it take to run the test beyond 85% offers little additional information for the cost. A solution may be possible at 50% recovery when low-permeability materials makes a test to 85% recovery impractical. This can be recognized by plotting the data during the test.

Techniques for slug withdrawal include pumping (pump rate must greatly exceed the maximum inflow rate) or bailing of water from the well. The withdrawal time must be short in order to approximate an instantaneous withdrawal. Another is using a weighted float, which may be a pipe sealed at both ends ("slug") which is lowered into the well until it reaches a level at which it floats. The well is allowed to return to equilibrium (static water level) at which time the pipe is rapidly removed from the well resulting in an instantaneous drop in the water level. As described above, the upward recovery of the water levels are measured and plotted against elapsed time. Since no water is discharged using the weighted float, its use may be preferable in cases where ground water is contaminated and must be contained.

The method of aquifer permeability testing using pressure transducer data and an electronic data logger generally follows a procedure suggested by Prosser (1981). The procedure utilizes a pneumatically-induced depression of the water level in a well and subsequent water level recovery measurements recorded by an electronic pressure transducer and data logger. Interpretation of the collected data is accomplished following techniques formulated by Bouwer and Rice (1976), Cooper et. al. (1967), Hvorslev (1951), Lohman (1975), Papadopulos et. al. (1973), or Ramey, et. al. (1975).

Prior to installation of aquifer test equipment, the static water level for the tested well

should be recorded by electronic water level indicator into the well and measuring to the nearest hundredth of a foot. If the static water level is below the top of the screened portion of the well as recorded on the well installation diagrams, this method of permeability testing may not be performed, and standard slug testing procedures may be utilized. Standard slug testing procedures are described elsewhere in this Section.

The permeability test is performed by installing an airtight well head to the well standpipe and lowering a calibrated pressure transducer into the well to a depth of 2 to 70 feet below the static water level. The well head assembly consists of a 2 inch PVC "tee" with a ball valve. The top of the well head consists of a rubber packer which holds the pressure transducer cable and provides an airtight seal.

After installation of the pressure transducer and well head assembly with the ball valve open, the water level is monitored by the transducer to assure stabilization at static conditions. Once water levels have stabilized, a static water level reference of zero is input into the transducer recorder. Response of the transducer is verified by analysis of manual water level measurements and well construction details.

Well construction diagrams are reviewed to determine the depth to the top of the screened portion of the well, and the static water level is subtracted to determine the maximum head change allowable before the water level drops to the top of the screen. If the tested well is sufficiently shallow that the maximum allowable head change is less than 5 feet, a 1.5 foot buffer is then subtracted from the maximum allowable head change and used to compute the induced pneumatic pressure head needed to depress the water level and preclude the introduction of air into the aquifer. The induced pneumatic pressure head utilized in deeper wells will vary depending upon the water level recovery rate as indicated from well development records to cause a water level head change of 2 to 65 feet. Wells known to have very slow recovery rates will be depressed 2 to 5 feet, whereas wells known to have very fast recovery rates will be depressed 10 to 65 feet. In no case will the water level be depressed lower than 1.5 feet above the top of the well screen.

The pressure calculated to depress the water level is controlled by a precision regulator from compressed air tanks. Compressed air is injected into the well (ball valve closed) through an airtight port in the well head assembly. Two air filters (0.5 and 0.4 microns) are installed

on the compressor to preclude the introduction of oil or water into the well. Upon pressurizing the well, transducer readings will rise to a maximum value close to the induced pneumatic head for wells screened in relatively low permeability formations. As air displaces water from the well casing, the pressure recorded by the transducer drops. When transducer values drop to near the previously input reference level (zero), equilibrium between induced pressure and water level (head) pressure has been reached and the aquifer response test may begin. This period of pressurization will be retained in the memory of the data recorder for quality control purposes.

The relatively instantaneous release of the induced pressure is achieved by opening the ball valve on the well head assembly and simultaneously depressing the data logger button. Water level recovery measurements are automatically recorded by the data logger at the following increments:

Time Elapsed Since Pressure Released	Measurement Interval
0-2 sec	0.2 sec
2-20 sec	1 sec
20-120 sec	5 sec
2-10 min	0.5 min

Water level measurements will be recorded every minute after the first 10 minutes until static or near static water level is obtained.

Data recorded by the data logger during pressurization and recovery are electronically transmitted to a portable field computer at the end of the day and assigned a unique file name corresponding to the well number followed by the "P" for pressurization data and "R" for water level recovery data. Both files will be followed by the extension "HMT" which designates them as HERMIT data files.

Screen plots of water level recovery data will be reviewed to assure that adequate data have been obtained from the tests. If data plots reveal abnormal curve shapes or questionable results, the test is repeated.

In instances where the measured water level is below the top of the screen or where poor well recovery is noted during development, the hydraulic conductivity may be measured using standard slug testing procedures. Further discussion of standard slug testing procedures is given in Section 6.1.

5.0 EQUIPMENT AND CALIBRATION

Equipment and materials necessary for the implementation of this procedure are listed below:

- HERMIT Data Logger and Instruction Manual
- Pressure Transducer, Cable, Reel, and "Jumper Cable"
- Field Computer
- Data Reduction and Analysis Software and Instruction Manual
- PVC (or other approved material) Slug and Rope
- Well Head Assembly
- Compressor with Regulator, Discharge Hose, Fittings, and Air Filters
- Water Level Indicator or Steel Tape
- Tape Measure
- Well Installation Diagram
- Permeability Testing Data Sheets
- Project Logbook
- Field Clipboard
- Additional two-in. PVC (slip-on X threaded) Connectors
- Tools: Screwdriver, Crescent Wrench, Two-24 inch Pipe Wrenches
- Teflon Tape
- Gas Can
- SAE 30 Motor Oil

The pressure transducer and the HERMIT Data Loggers are the only equipment which

require calibration. The pressure transducer is manufacturer-calibrated to an accuracy of 0.1 percent of full scale. Therefore, the 20 psi transducer is accurate to a minimum of 0.046 feet, and the 50 psi transducer is accurate to a minimum of 0.115 feet. The permeability test procedure, however, measures the variation of water levels and is, therefore, responding to the precision of the transducer. The transducer precision is 0.015 percent of full scale, resulting in precision of 0.006 feet for the 20 psi transducer and 0.017 feet for the 50 psi transducer. A 20 psi transducer will be utilized for most field permeability testing. The HERMIT Data Logger is calibrated by the manufacturer and is equipped with an automatic self-test feature. If the equipment will not successfully complete the self-test, it cannot be recalibrated in the field and must be returned to the manufacturer.

6.0 PROCEDURE

6.1 Field Permeability Test - Slug Test

After identification of a well to be tested by a slug test technique, a static water level measurement is taken with an electronic water level indicator and recorded to the nearest hundredth of a foot, referenced to the top of casing (TOC). This value is entered on the permeability test data sheet and the field notebook. The field permeability test data sheet is shown in Figure 8 of the QA/QC Plan. The well installation diagram is then consulted to determine the distance from the TOC to the top of the screen and recorded on the data sheet. Additional data recorded includes the length of the well screen, radius of the well casing, and radius of the well screen.

If a slug is being introduced, then water is added to the well initiating the slug test. Water levels are then recorded with the electronic water level indicator as a function of time until the water level has stabilized. The first measurement should be made immediately after the slug is injected and successive measurements should be made rapidly at first and decrease as the test progresses. Since early data are critical, as many measurements as possible should be obtained during the first minute of the test. The interval between measurements will be dependent on the recharge rate. The test continues until 85% recovery has occurred, if practical.

If a slug of water is being removed either by pumping or bailing, measurements of well

recovery commence immediately after removal of the slug and proceed as described above. If a weighted floating slug is used, the slug is lowered slowly into the well and the well is then allowed to recover to its static level. The slug is then rapidly removed from the well and water level measurements of the recovery commence. The test then continues as described for injection of a slug.

Data (water level versus elapsed time) is recorded in the field log book and can be plotted in the field if necessary. The method of plotting is dependent on the data reduction method.

Data can be recorded using a data logger as described in Section 6.2 and briefly described below. Data recorded by the data logger during slug injection and withdrawal will be transmitted to a portable field computer at the end of the day and assigned a unique file name corresponding to the well number followed by "I" for slug injection data and "W" for slug withdrawal data. Both files will be followed by the extension "HMT" designating them as HERMIT data files.

After identification of a well to be tested by standard slug testing techniques, the static water level is taken with an electronic water level indicator and recorded to the nearest hundredth of a foot, referenced to TOC, and entered on the field permeability test data sheet. The transducer is then lowered into the well 3 to 20 feet below static water level. The transducer is monitored to assure equalization of the water level by depressing the XD key on the HERMIT. Record the static transducer head value on the data sheet, then set the reference level to 000.00.

The HERMIT is configured for the test by the same procedure as the Prosser technique below.

Measure the slug and length of rope to suspend the slug one foot above the static water level. Lower the slug to this level and tie off. Check the transducer to assure equalization of the static water level. Simultaneously lower the slug until submerged and depress the START key on the HERMIT followed by the ENTER key to begin recording data. Data will be recorded until the water level falls to static or near static water level. Upon water level stabilization, depress the START key on the HERMIT to prepare for slug withdrawal data collection. Simultaneously withdraw the slug to a point above the static water level and depress the START key followed by the ENTER key to record the water level recovery data (Step 1).

Continue data collection until the recovery rate slows to less than 0.01 feet in two minutes or until the reference level (0.00) is reached. Stop the test by holding down the ENTER key and depressing the STOP/NEXT key, then depress the ENTER key when the display reads STOP.

Data transfer and conversion is performed as described above in the Prosser technique.

6.2 Field Permeability Test - Prosser Technique

After identification of a well to be tested by the Prosser technique, a static water level is taken with an electronic water level indicator and recorded to the nearest hundredth of a foot, referenced to the top of casing (TOC). This value is entered on the permeability test data sheet. The field permeability test data sheet is shown in Figure 1. The well installation diagram is then consulted to determine the distance from the TOC to the top of the screen and recorded on the data sheet. If the static water level is below the top of the screen or less than 1.5 feet above the screen, the Prosser slug test method may not be used. In this case, standard slug testing procedures may be utilized. Standard slug testing procedures are described elsewhere in this Section.

Once the static water level is recorded, the well head assembly may be installed at the TOC.

The drawdown required to depress the water level is calculated as discussed in Section 5.0 of this procedure. Multiply the desired drawdown by 0.4335 to convert the drawdown in feet to pressure head required to produce the drawdown, and enter the value on the data sheet.

The well head assembly should then be installed by applying Teflon tape to the threaded coupling and threaded onto the coupling until secure (use pipe wrenches if necessary). This procedure should be conducted with the ball valve on the well head open. After securing the well head, loosen the rubber packer at the top of the well head and lower the pressure transducer into the well until it is 2 to 70 feet below the static water level. The rubber packer should then be tightened to secure the transducer cable and suspended transducer at the proper depth. Refer to the HERMIT owner's manual for jumper cable connection and general operation procedures (In-Situ, 1986 (a) and (b)).

The HERMIT must now be configured for the test. Select the proper test number (0-9) and record on data sheet. The sampling rate should be set to logarithmic for the first ten

minutes and once every minute thereafter. Select one input in the LEVEL mode. Set the scale and offset to the values stamped on the transducer body and transducer cable reel. Do not set the reference level. Set the display mode in English units measured from TOC. After configuring the HERMIT, depress the XD key and observe the water level to assure stabilization at static conditions. Monitor the water level until a change of less than 0.01 feet occurs for a period of ten or more minutes. When the water level has stabilized, record the static transducer head value on the data sheet, then input a reference level of 000.00 and record on the data sheet. Check the operation of the unit by depressing the XD key. Verify that the reading given by the transducer is the same as before entering the reference value before continuing. If the reading is not the same, reset the reference level.

After setting the reference level, check to verify that the air discharge hose <u>is not</u> connected to the well head and start the air compressor. Adjust the output from the compressor to the required pressure for desired drawdown using the regulator and secure using the locknut. If the pressure required to produce the desired drawdown is greater than three psi, the well should be pressurized at three psi for the first ten minutes of the test. After ten minutes, the HERMIT data may be accessed to assure that pressure stabilization has occurred. The well should then be pressurized in two to five psi increments, allowing pressure stabilization between pressurization increases, until the final desired pressure is reached. Prepare the HERMIT to record the pressurization data by depressing the START key on the HERMIT. The display should show the test number followed by the word START. Close the ball valve on the well head and begin pressurizing the well casing by connecting the air discharge to the well head and simultaneously depressing the ENTER key on the HERMIT to begin recording data. The maximum head value during early pressurization should be approximately equal to the induced pneumatic head in low permeability aquifers. Continue monitoring transducer pressure by depressing the XD key until the pressure stabilizes at a value near the static transducer head value (zero).

After pressure stabilization has occurred, the water level recovery data may be collected. To start the test, depress the START key on the HERMIT. The display should show the test number, followed by STEP 1. Simultaneously open the ball valve on the well head and depress the ENTER key again, and recovery data will begin to be collected by the data logger. Turn

off the air supply valve on the compressor as soon as the test is begun. After the first ten minutes of data collection, the water level may be monitored by depressing the XD key. Continue data collection until static or near static water levels are reached (HERMIT display of zero or near zero). Stop the test by holding down the ENTER key and depressing the STOP/NEXT key, then depress the ENTER key when the display reads STOP.

After collecting water level recovery data, transfer the data to a floppy disk using the portable computer in conjunction with HERMIT-DM software (In-Situ, 1987). Insert the data diskette into drive A of the computer. Check to assure the RS232 cable is securely connected to both the HERMIT and the computer. Configure the HERMIT to a baud rate of 2400, 8 data bits, no parity, and carriage return for end of line. Select the appropriate test number on the HERMIT by depressing the DATA key and scanning the available tests. Call up HERMIT-DM from the appropriate directory by typing "HERMIT-DM." Configure HERMIT-DM by choosing option C from the main menu. Configure to default drive A, communications port 1, HP 7475 plotter, 2400 baud rate, no parity, 8 data bits, and 1 stop bit. Select option 1 from the main menu. Select option 1 from the Data Transfer/Conversion menu to transfer HERMIT data to the data file. Type in the appropriate HERMIT file designation corresponding to the well and test number, followed by the extension .HMT. Record this file designation on the data sheet. Make sure the display on the HERMIT is Out (test number flashing). If not, start from status display, depress the DATA key, and select the appropriate test number. Press the enter (carriage return) key on the computer, then depress the ENTER key on the HERMIT.

When data transfer is complete, return to the main menu and select option 1 to return to the Data Transfer/Conversion menu. Select option 2 from this menu to convert the data for manipulation within HERMIT-DM. Enter the name of the HERMIT file just created (XXXX.HMT) and the designation of the new data field name (same as the HERMIT file designation with extension .DAT). The computer will prompt to verify the reference level. Check the screen to verify correct level and if correct, depress the enter key. If the reference level is incorrect, enter the correct level from the field data sheet.

After conversion of the data, select option 3 from the main menu to preview a plot of the data on the screen. Enter the appropriate data file designation and the Level vs. Time Editor menu will appear. Do not select to generate a table. Select to preview the plot on the screen.

The plot file name should be the same as the data file with extension .PLT. Choose the data to be represented by a line. The remaining default values should be correct. Depress the ESC key and choose to continue. The program will display a plot of the data on the screen. While the plot is displayed on the screen, connect the printer and depress the shift and print screen keys simultaneously to obtain a hard copy of the plot. Examine the curve to verify that adequate data has been collected. The initial data may be irregular, but the remainder of the curve should be smooth. If abnormal shapes or irregular curves are found, repeat the test. If the curve is satisfactory, exit to MS-DOS.

TECHNICAL PROCEDURE 6

Sample Preservation

Containers and Holding Time Specifications

Analytical Test	Preferred Volume/ Container	Preservative or Sample Handling	Holding Time
Purgeable Aromatics and Halocarbons			
(water)	2-40 ml glass VOA vials (Teflon-lined lids), no headspace	Cool to 4°C	Analyze within 14 days
(soil)	2-4 oz. glass widemouth VOA jars (Teflon-lined) lids), no headspace	Cool to 4°C	Analyze within 14 days
Base Neutral Acid Extractables (BNA) from Polynuclear Aromatic Hydrocarbons (PAH)			
(water)	2-1 liter amber glass bottle (Teflon-lined lid)	Cool to 4°C	7 days until extraction, analyze within 40 days of collection
(soil)	1-8-oz. widemouth glass jar (Teflon-lined lids)	Cool to 4°C	14 days or 7 days until extraction, analyze within 40 days of collection*

Containers and Holding Time Specifications

Analytical Test	Preferred Volume/ Container	Preservative or Sample Handling	Holding Time
Metals			
(water)	100 ml Plastic or glass	HNO_3 pH<2	6 months
(soil)	Plastic or Glass - 100 grams	Cool to 4°C	6 months
Phenols, Phthalate Esters, Organochlorine pesticides and PCBs, Chlorinated Hydrocarbons, Organophosphorous Pesticides, and Chlorinated Herbicides			
(water)	1000 ml Amber glass with Teflon Lined Lid	Cool to 4°C	14 days or 7 days until extraction, analyze within 40 days of collection*
(soil)	1000 ml Amber glass with Teflon Lined Lid	Cool to 4°C	14 days or 7 days until extraction, analyze within 40 days of collection*

* Depends upon sample matrix

Containers and Holding Time Specifications

Analytical Test	Preferred Volume/ Container	Preservative or Sample Handling	Holding Time
BOD (water)	500 ml Plastic or Glass	Cool to 4°C	48 hours
COD (water)	250 ml Plastic or Glass	Cool to 4°C, H_2SO_4	28 days
TOC (water)	100 ml Plastic or Glass	Cool to 4°C, H_2SO_4 pH < 2	28 days
TOX (water)	500 ml Amber Glass with Teflon Lined Cap	Cool to 4°C	14 days

TECHNICAL PROCEDURE 7

Surface Water Sample Collection (Grab)

The surface water samples will be collected as discrete grab samples. A discrete sample is a single sample collected from one sampling point in the water body.

The following equipment will be needed to obtain surface water samples:

- Sample bottles and preservatives (ice)
- One five-gallon stainless steel kettle
- Conductivity meter
- pH meter
- Thermometer
- Distilled or deionized water
- Paper towels

When collecting a discrete surface water sample, the following procedures will apply:

- Assemble sample bottles (to be provided by laboratories).
- Record the date, time, weather conditions, and any site-specific factors related to the water quality at each sampling location.
- Rinse all sample bottles at least once with the water from the source it is to be sampled.
- Collect the sample by submerging each bottle below the surface and filling and capping the bottle.
- Measure temperature, pH and conductivity of the point of collection.
- Rinse bottles with deionized water and wipe with clean paper towels.
- Place the sample bottles on ice in coolers.

TECHNICAL PROCEDURE 8

Equipment Decontamination Procedures

Equipment Decontamination Unit Construction

An equipment decontamination unit with dimensions of at least eight feet by 16 feet will be constructed in a designated area. The unit will have side walls of at least four feet high on the two short sides and one long side. The walls and floor of the structure will be covered with impermeable material and the floor will be sloped so that liquid and solid wastes can be collected and placed in steel 55-gallon drums. The floor will be protected so that drill rigs can be backed into the unit for decontamination of the drill and rear portions of the carrier. Equipment and materials to be supplied include a steam cleaner (pressure washer is not acceptable), an adequate generator, brushes, auger racks, trash pumps, open and closed top 55-gallon steel drums, barrel handling equipment, methanol and methanol sprayer, tri-sodium phosphate, and miscellaneous hand tools.

Equipment Decontamination Procedures Prior to Drilling

The rear portion of the drill rig and carrier and all drilling and sampling equipment which will come into contact with soil and/or ground water from soil borings will be cleaned in the following manner:

1. Soil and residue will be scrapped off equipment.
2. Equipment will be cleaned with brushes and a solution of tri-sodium phosphate.
3. Equipment will be steam cleaned.
4. Equipment will be sprayed with methanol.
5. Equipment will be steam cleaned.
6. Drilling and sampling equipment including, but not limited to, samplers, augers, center rod, and pilot assemblies will be wrapped in clean plastic sheets for transport to the drill site.

Equipment Decontamination Procedures Between Boreholes and Monitoring Wells

All drilling and sampling equipment which will come into contact with soil and/or ground water from soil borings will be transported from the completed drill site to the decontamination unit and cleaned in the following manner:

1. Soil and residue will be scraped off equipment.
2. Equipment will be cleaned with brushes and a solution of tri-sodium phosphate.
3. Equipment will be steam cleaned.
4. Equipment will be sprayed with methanol.
5. Equipment will be steam cleaned.
6. Drilling and sampling equipment including, but not limited to, samplers, augers, center rod, and pilot assemblies will be wrapped in clean plastic sheets for transport to the drill site.

Sampling Equipment Between Samples at Individual Boreholes

Sampling equipment will be decontaminated between each sample at the borehole and water wastes will be discharged to the surface. Cleaning procedures will be as follows:

1. Sample equipment will be cleaned with brushes and a solution of tri-sodium phosphate.
2. Equipment will be rinsed with potable water.
3. Equipment will be sprayed with methanol.
4. Equipment will be rinsed with deionized or distilled water.

Equipment Decontamination Procedures Before Removing Equipment from the Site

All drilling and sampling equipment which will come into contact with soil and/or ground water from soil borings will be transported from the completed drill site to the decontamination unit and cleaned in the following manner:

1. Soil and residue will be scraped off equipment.

2. Equipment will be cleaned with brushes and a solution of tri-sodium phosphate.
3. Equipment will be steam cleaned.
4. Equipment will be sprayed with methanol.
5. Equipment will be steam cleaned.

Well Risers and Screens

All well risers (casing) and screens will be decontaminated prior to installation in the following manner:

1. Materials will be steam cleaned.
2. Materials will be sprayed with methanol.
3. Materials will be steam cleaned.
4. Materials will be wrapped in clean plastic sheets for transport to the drill site.

Sample Containers

Cleaned sample jars contained in a sealed shipping container (cooler) will be supplied by the laboratory. Shipping containers will remain sealed until samples are collected.

VENDOR SPECIFICATIONS

SHANNON & WILSON, INC.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141-7126
(314) 872-8170

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Over 35 Years of Excellence

11500 Olive Boulevard, Suite 276 • St. Louis, MO 63141-7126 • (314) 872-8170 • Fax: (314) 872-8178

March 12, 1992 Z-301-01

Advanced Environmental Drilling & Contracting
31 Eton Court
Springfield, Illinois 62702

Attention: Mr. Greg Courson

Reference: Environmental Soil Boring and Ground Water Monitoring Well Installation at the Steelcote Manufacturing Company Facility in St. Louis, Missouri

Gentlemen:

You are invited to submit a bid to conduct environmental drilling which will include making soil borings and installing ground water monitoring wells. The successful bidder will contract directly with Niedt Realty Company, owner of Steelcote Manufacturing Company. Note that the successful bidder will also be required to submit a Certificate of General Liability naming the Steelcote Manufacturing Company as an insured party to the client prior to commencement of work.

Attached to this letter are Bid and Specifications including specifications for work and performance payment, and a schedule of quantities and prices. In addition, there are enclosed a Plan of Study, Technical Procedures, and a Hazard Assessment and Safety Plan. Please familiarize yourself with this information as the successful bidder will be held accountable for the appropriate contents.

A site visit is recommended and can be arranged by contacting Mr. James Moore or Mr. Douglas Niedt at the Steelcote facility (314/771-8053). Your bid should reflect conditions at the site including but not limited to access requirements, provision of water and power, etc. Please note that the driller will also be responsible for utility clearances.

Include with your bid a Statement of Qualifications including experience, references, a list of equipment to be used at the site and a list of the individuals to be assigned to site work. Note that the successful bidder will be required to provide documentation that individuals assigned to work on the site participate in a medical surveillance program and are currently certified for work at hazardous waste sites as per 40 CFR Part 1910.120. The driller will also be responsible for providing personal protective equipment for the drill crew.

Please complete the enclosed Schedule of Quantities and Prices. If you wish to comment on or take exception to the form; make recommendations; or, add pay items, do so on a separate sheet and cross reference both the schedule and the attached sheet.

Please submit your bid and support documents by 5:00 P.M., March 20, 1992, to:

Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Thank you,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

Enclosures: Performance Specifications
Payment Specifications
Schedule of Quantities and Prices
Plan of Study
Hazard Assessment and Safety Plan
Technical Procedures

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Geotechnical and Environmental Consultants

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March 12, 1992 Z-301-01

Layne Western Co.
2399 Cassens Drive
Fenton, Missouri 63026

Attention: Mr. Dave Meyer

Reference: Environmental Soil Boring and Ground Water Monitoring Well Installation at the Steelcote Manufacturing Company Facility in St. Louis, Missouri

Gentlemen:

You are invited to submit a bid to conduct environmental drilling which will include making soil borings and installing ground water monitoring wells. The successful bidder will contract directly with Niedt Realty Company, owner of Steelcote Manufacturing Company. Note that the successful bidder will also be required to submit a Certificate of General Liability naming the Steelcote Manufacturing Company as an insured party to the client prior to commencement of work.

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Thank you,

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March 12, 1992 Z-301-01

Brotcke Engineering, Inc.
P.O. Box 1168
Fenton, Missouri 63026

Attention: Mr. Terry Hart

Re: Environmental Soil Boring and Ground Water Monitoring Well Installation at the Steelcote Manufacturing Company Facility in St. Louis, Missouri

Gentlemen:

You are invited to submit a bid to conduct environmental drilling which will include making soil borings and installing ground water monitoring wells. The successful bidder will contract directly with Niedt Realty Company, owner of Steelcote Manufacturing Company. Note that the successful bidder will also be required to submit a Certificate of General Liability naming the Steelcote Manufacturing Company as an insured party to the client prior to commencement of work.

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Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Thank you,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

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March 12, 1992 Z-301-01

Burlington Environmental
210 West Sandbank Road, P.O. Box 330
Columbia, Illinois 62236-0330

Attention: Mr. Kent Schaffer

Reference: Environmental Soil Boring and Ground Water Monitoring Well Installation at the Steelcote Manufacturing Company Facility in St. Louis, Missouri

Gentlemen:

You are invited to submit a bid to conduct environmental drilling which will include making soil borings and installing ground water monitoring wells. The successful bidder will contract directly with Niedt Realty Company, owner of Steelcote Manufacturing Company. Note that the successful bidder will also be required to submit a Certificate of General Liability naming the Steelcote Manufacturing Company as an insured party to the client prior to commencement of work.

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Vice President
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St. Louis, MO 63141

Thank you,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

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PERFORMANCE SPECIFICATIONS

1.0 PRE DRILLING ACTIVITIES

This work includes the furnishing of all labor, materials (including DOT 17E or 17H 55 gallon steel drums), tools, equipment, and the performance of all operations and incidental work necessary for making soil borings, drilling, and installation of wells at the Steelcote Facility in St. Louis, Missouri. The work is anticipated to be conducted during the Spring of 1992.

1.1 Mobilization

Deliver to the job site a complete drilling rig with all construction equipment, tools, material, supplies, adequate equipment for steam cleaning, and establish a work force sufficient to commence and sustain uninterrupted drilling, soil sampling, and installation of wells as specified.

1.2 Decontamination Unit Construction

A decontamination unit will be constructed by the driller that will allow capture of all residue resulting from decontamination of drilling and sampling equipment and well construction materials. The facility shall be at least 8 feet by 12 feet with 6-foot side boards on one long side and both short sides. The unit will be lined with impervious material with a floor contoured so that liquids and residue can be contained and collected. The unit will be sufficiently durable to resist decontamination operations including driving the drill rig onto the floor and weather conditions other than acts of God.

1.3 Demobilization and Cleanup

Clean up work areas; provide final decontamination of equipment and unused material at completion of the Subcontract. Leave all work areas in a condition similar to that found before the work commenced. Steelcote Manufacturing Company will be the final arbiter of work area conditions.

1.4 Standby Time

Standby time will be provided during periods of work stoppage when stoppage is requested by the site manager or when it is necessary for the drill crews to wait for instructions from the site manager. Standby time does not include work stoppage ordered by the site manager due to unsafe or incorrect work practices, inoperative equipment, or weather conditions.

If drill locations are not provided and drilling crews are not placed on standby, the driller has authorization to demobilize drill crew and rig at their expense.

2.0 DRILLING OPERATIONS

2.1 General

The driller shall employ only experienced, competent, and safety certified drillers and helpers. They shall have a thorough working knowledge and be capable of performing all drilling, sampling, coring, and well installation techniques to be employed at this site.

The driller shall designate a site representative among his work force to act for the driller throughout the life of this contract. This representative shall have a thorough and working knowledge of the Plan of Study, the Hazard Assessment and Safety Plan, this document, and all drilling techniques to be used in this contract. He shall be available at the site of work at all times when subcontract work is performed and shall be capable of reporting the status of all work as requested.

The driller is required to submit to the site manager or his designated representative a detailed report of drilling activities for each location every day, including measurement for each pay item. The report shall be completed in two copies. The site manager will verify quantities, note discrepancies, sign, and return one copy to the driller's representative on the following work day.

It is anticipated that the soil borings and wells will be drilled at or close to the approximate locations shown in Figure 5 of the Plan of Study. In addition, additional soil borings and wells may be required at the facility. These borings and wells shall be located and installed in the sequence directed by the site manager. The locations shown are for estimating purposes only; the actual locations will be determined by the site manager in accordance with the utility clearances obtained by the driller as the field work progresses. Additional drilling may be required at locations determined by the site manager. Additional drilling services will be completed by the driller at the rates established by the Subcontract.

A stop work order may be issued prior to the completion of all work. If a stop order is issued, the driller will be compensated for only such work as has been actually completed and reasonable demobilization costs.

All drilling equipment, hand tools, and down-hole equipment will be decontaminated prior to any drilling activity. Prior to drilling and sampling of each borehole and resetting up on boreholes, the driller shall thoroughly decontaminate the drill rig, all hand tools, and all down-hole tools as described in the attached Plan of Study. Prior to well construction, screen and riser pipe will also be decontaminated. Cleaning activities will be overseen by the site manager or his representative and will take place at the decontamination unit. All equipment will be transported to or from the decontamination unit on the drill carrier or in a trailer or truck lined with clean plastic.

No drilling additives, organic solvents, or cleaning solutions shall be introduced into the wells for any reason. The equipment and material clean up procedures presented in these specifications and the Plan of Study shall be strictly observed.

Foreign matter, excluding necessary drilling equipment and materials, shall be prevented from entering the soil borings and wells.

When gravel, boulders, abandoned man-made obstacles, or similar obstructions are encountered during drilling, or if unstable material is encountered, suitable methods shall be used to drill through such obstructions. Properly cleaned temporary casing may be used where necessary to keep the holes open and enable the hole to be advanced. Approval to drill through obstructions shall be obtained by the driller from the site manager prior to advancing the hole. Abandoning the borehole and drilling another borehole nearby shall be done only with prior approval of the site manager.

Drilling shall not be stopped permanently before reaching the required depth without prior approval from the site manager. Boreholes abandoned before reaching the required depth because of equipment failure, negligence, or other such causes shall be rejected and shall be replaced at the cost of the driller. The location of the replacement hole will be determined in the field by the site manager. Any abandoned borehole shall be backfilled with cement/bentonite grout emplaced from bottom to top as specified herein at the driller's expense. When drilling replacement holes, penetration to the depth where the last satisfactory sample was obtained shall be made by the same method as specified for the

original hole; however, no samples are required to be collected by the driller to the depth of the abandoned hole. Below the elevation where the original hole was abandoned, penetration shall be made and samples taken in the replacement hole in the same manner specified for the original hole.

Implementation of these specifications, including all measurements made by the driller, shall be witnessed by the site manager or his representative.

2.2 Equipment

The driller shall provide drilling machines with hydraulic feed in good working condition. Drills shall be mounted on carriers adequate to provide ready access to the drill location. The drilling machines shall meet the following additional specifications.

The driller shall provide a drill machine capable of obtaining continuous samples within a 6.25 in. inside-diameter (ID) hollow stemmed auger in unconsolidated materials including but not limited to soil, alluvium, fill, loess, glacial drift, and weathered bedrock.

Supplies for drilling shall include all augers, casings, drill rods, bits, samplers, core barrels, pipes, pumps, packers, water meters, pressure gages, steam cleaner(s) and cleaning supplies, wooden core boxes, and a water truck or water pipeline.

2.3 Drilling

Drilling through unconsolidated materials shall be accomplished using 6.25 in. ID, hollow stemmed augers. Water shall not be used during auger drilling. Sampling of surficial materials may be accomplished using the techniques described below.

2.3.1 Continuous Samples

Continuous sampling through unconsolidated material will be accomplished using a CME continuous sampler or equivalent in conjunction with hollow stemmed augers. The continuous sampling device is available from Central Mine Equipment Company (CME), 6200 North Broadway, St. Louis, Missouri 63167. The subcontractor shall place each

recovered sample in a trough for logging and handling by the site manager or his representative. The sampling device shall be decontaminated prior to reuse. Clean, potable water may be used as an auger lubricant or to maintain a water level within the hollow stem above that of the formation to prevent blowback only with prior approval of the site manager or his representative.

2.3.2 Split-Spoon Samples

Split-spoon samples may be taken at the discretion of the site manager or his representative. Approximately 6 in. of representative material selected by the site manager shall be collected from each split spoon sample. Split-spoon samples shall be obtained by Standard Penetration Test Method using a 1 in. or larger O.D. split-spoon sampler in accordance with ASTM 1586-84.

Thin-walled (Shelby) tube samples may also be taken in soil, glacial deposits, and weathered bedrock, at the discretion of the site manager or his representative. These samples shall be taken in accordance with ASTM D-1587-83.

Unsampled auger boreholes shall be advanced using the hollow stemmed auger with a bit installed at the tip.

2.4 Well Construction

Only one well will be constructed in a borehole. The length of the screen and depth of placement will be determined by the site manager or his representative. All down-hole drilling equipment, screens, and riser pipes shall be required to be decontaminated prior to use.

Ground water monitoring wells will be constructed of 2 inch inside-diameter PVC riser pipe and screens. Riser pipe sections and screen will be assembled as a string and lowered into the hole. A bottom cap or plug shall be secured in place prior to lowering the pipe. During assembly of the pipes, and prior to introduction into the hole, the pipes will be tied off to the rig to hang suspended above the bottom of the hole by approximately 1

ft. to avoid damage or contamination of the screen section.

A sand pack will be introduced around and above the screen. The placement of sand will be done slowly so that "bridging" of the sand does not occur and sand grains settle in place. Water may be added with the sand to facilitate a smooth flow of sand into the hole only if approved by the site manager. The top of the placed sandpack will be sounded to confirm the depth to the top of the sandpack.

After confirmation of sandpack depth, an annular seal of bentonite pellets or slurry shall be added slowly to the hole to form a 2 ft minimum thick plug to insure a pressure proof plug. In those installations where the screened interval is very near the ground surface and does not allow for a 2 ft thick plug, the annulus will be sealed from the sand pack to the ground surface using bentonite pellets to form a plug with a minimum thickness of 6 in. At least thirty minutes will be allowed to permit the bentonite pellets to swell and seal the zone. If water is present above the sand pack, the seal shall be formed with a commercial bentonite grout mixed in accordance with the manufacturer's recommendations and injected under pressure.

A cement bentonite grout shall be introduced through a grout pipe with side discharge from the top of the bentonite plug to the ground surface. In case of loss and shrinkage of grout, the hole shall be refilled in the same manner to the desired depth.

A 4 in. ID or larger recessed protective casing (lockable) and concrete collar shall be installed at each well. Riser pipes for the wells shall be 2 in. ID flush threaded joint, Schedule 40 PVC. The top of the riser pipe shall be finished with a female NPT fitting. A threaded plug with 1/4 in. diameter vent hole shall be loosely fitted into the top of the riser pipe. The driller shall submit a representative sample of the material to the site manager for archiving and a catalog cut of the PVC pipe to the site manager for approval.

Well screens, including all fittings and accessories, shall be 2 in. ID flush threaded joint, Schedule 40 PVC with 0.010 in. wide machine slot openings. The driller shall submit a representative sample of the material to the site manager for archiving and a catalog cut of the screen to the site manager for approval.

Filter pack material shall be clean, well-graded, silica sand, conforming to ASTM C 136, Fine Aggregate or other as approved by the site manager. One hundred percent by weight shall pass a No. 4 U.S. Standard Series Sieve, and less than five percent by weight shall pass a No. 100 U.S. Standard Series Sieve. The driller shall submit a representative sample of the material to the site manager for archiving and a certified sieve analysis of each lot of the filter pack material used to the site manager for approval.

Material used for the annular seal shall consist of bentonite pellets or granules if the borehole is advanced by auger or air rotary method and is dry at the time of seal placement. This material shall be a commercial bentonite grout for boreholes which are not dry at the time of seal placement. The driller shall submit a representative sample of the material to the site manager for archiving and of the seal materials used to the site manager for approval.

Cement/bentonite grout shall be mixed in approximately the following proportions or as agreed to by the site manager: 5.5 gallons of water and 3 pounds of powdered (100 barrel yield) bentonite per 94 pound sack of portland cement. All cement/bentonite grout shall be free flowing. The driller shall submit a representative sample of the material to the site manager for archiving and catalog cuts for the bentonite and portland cement to the site manager for approval.

Surface protection shall be a recessed 4 in. ID or larger, nominal round or square, standard-weight steel or structural tube and shall be fitted with a steel protective cap that can be locked with a padlock. Keyed-alike padlocks for all wells will be furnished by the driller.

Concrete for placement of the protective cover shall be Portland cement concrete. All concrete and concrete materials shall be in accordance with ACI 318.

Water used for cleaning or as a drilling fluid shall be clean, potable water approved by the site manager.

2.5 Procedure for Well Installation

All downhole drilling equipment used for the installation of all boreholes shall be decontaminated prior to drilling at each location to minimize cross contamination from one location to another. Sufficient drying time shall be allowed following rinsing. Well riser pipes, screens, and fittings are to be delivered to the site in a clean condition and shall be decontaminated prior to installation. All downhole tools and well materials shall be adequately protected with clean plastic sheeting from the time they are cleaned until they are installed in the borehole.

Before installation of the screens and riser pipes, the final depth of the hole shall be measured. All measurements shall be observed by the site manager or a selected representative.

The screen shall be installed at a depth determined by the site manager or his representative. The screen and riser pipes shall be lowered into the hole.

The sand for the filter pack shall be poured into the annular space between the riser pipe and the bedrock, or hollow stem auger. If the well is constructed within temporary casing or a hollow stem auger, it shall be slowly withdrawn as directed by the site manager. The rate of withdrawal of the casing or hollow stem auger shall be such that the top of the sand filter pack is always within the casing or hollow stem.

After the sand filter pack is placed, the bentonite seal shall be formed in the annulus using a grout pipe as described below, or in the case of shallow or dry boreholes, bentonite pellets or granules may be poured into the hole.

Following placement of the annular bentonite seal, the remainder of the annular space between the riser pipe and sides of the hole shall be filled with the cement/bentonite grout to the level 3 ft below the adjacent ground level. The grout shall be installed by placing a grout pipe with side discharge to a point 2 ft above the bentonite seal and pumping the grout into the hole until the grout reaches the specified level, after which the grout pipe shall be slowly withdrawn from the hole. The lower end of the grout pipe shall be fitted with a deflector constructed such that grout will discharge perpendicular to the axis

of the borehole and not penetrate the bentonite plug.

If, as a result of improper installation, a well is considered inoperative or unsatisfactory by the site manager, the driller shall modify or replace the well with a satisfactory one at the expense of the driller. Abandoned wells must be sealed with grout to the surface.

A protective flush-mount finish, lockable protective cap, and concrete collar shall be installed at each well.

The concrete collar shall be finished in a manner that will prevent standing water in the vicinity of the casing.

After the well has been stabilized (at least 48 hours after completion), the driller will develop the well with the method and equipment to be used specified by the driller and approved by the site manager.

PAYMENT SPECIFICATIONS

Pay Item No. 1.1 Mobilization

Payment for mobilization will be made as a lump sum payment. The lump sum price shall be full compensation to mobilize a drill rig with sufficient supplies to commence drilling at the site and furnish all certificates required prior to commencement of drilling activity.

Pay Item No. 1.2 Decontamination Unit Construction

Payment for construction of a decontamination unit will be made as a lump sum unit. The lump sum price will be full compensation for construction and complete outfitting of the unit.

Pay Item No. 1.3 Demobilization

Payment for demobilization from the site will be made a lump sum. The lump sum paid shall constitute full compensation for all demobilization including removal and containerization of the decontamination unit and transport of 55-gallon drums to the designated area. The driller will supply the 55-gallon drums which must be DOT approved 17E and/or 17H (reconditioned drums are acceptable). Note that Steelcote Manufacturing Company has the option to provide the 55-gallon drums.

Pay Item No. 1.4 Standby Time

The driller will be paid for qualifying standby time on an hourly basis. The time will be determined on one hour increments and any single period less than one hour will not be paid.

Pay Item No. 2.1 Drilling

Compensation for these activities includes all required set up activities, relocation and decontamination.

Continuous Samples

Payment for drilling and sampling unconsolidated material using the CME continuous sampler will be for the total number of linear feet drilled and sampled, multiplied by the unit price established in the subcontract. The measurement of total linear feet will be made from the top of the ground surface to the bottom of the borehole and will be measured to the nearest 0.1 foot. This pay item includes all items and activities required to drill and sample the borehole.

Split-Spoon Soil Samples

Payment for split-spoon samples will be for the total number of split-spoon samples obtained, multiplied by the unit price established in the subcontract. This pay item includes all items and activities needed to drill and sample the borehole, including clean sample jars.

Thin-Walled Tube Soil Samples

Payment for thin-walled (Shelby) tube samples will be for the total number of tube samples obtained multiplied by the unit price established in the subcontract. This pay item includes all items and activities needed to collect and seal the samples including the Shelby tubes.

No Sampling

Payment for hollow stem auger drilling without sampling will be for the total number of linear feet drilled, multiplied by the unit price established in the subcontract. The measurement of total linear feet will be made from the top of the ground surface to the bottom of the borehole and will be measured to the nearest 0.1 foot. Payment for drilling

without sampling will be paid for boreholes advanced for split spoon and thin-walled tube sampling. This pay item includes all items and activities needed to drill the borehole.

Drilling Pavement

Payment for drilling through pavement or other materials not penetrable with hollow stem augers (concrete, cement, etc.) or drill rig accessible will be for the total number of linear feet drilled, multiplied by the unit price established in the subcontract. The measurement of total linear feet will be made from the top of the ground surface to the bottom of the pavement material and will be measured to the nearest 0.5 foot with a minimum payment of 0.5 feet for each boring requiring such drilling. This pay item includes all items and activities needed to drill the borehole.

Pay Item No. 2.2 Well Installation and Development

Payment for well installation and development will be based on the product of the total linear feet measured from the surface to the level of the base of the screen and the unit price established in the subcontract. Measurement and payment will be made to the nearest 0.1 foot. This price will include all labor and materials, decontamination of materials and well development activities.

Pay Item No. 2.3 Grouting Boreholes

Payment for grouting boreholes, if necessary, will be for the total number of linear feet grouted, multiplied by the unit price established in the subcontract. The measurement of total linear feet will be from the top of the ground surface to the bottom of the borehole and will be measured to the nearest 0.1 foot. This pay item applies to boreholes grouted at the request of the field manager and not to boreholes or wells abandoned as a result of defective materials or improper procedure by the driller. This pay item includes all materials, equipment, and activities needed to grout the borehole.

SCHEDULE OF QUANTITIES AND PRICES - LEVEL D

LIST OF PAY ITEMS AND PRICES

1.0 LUMP SUM PRICES

Item No.	Description	Quantity	Units	Unit Cost	Extended Cost
1.1	Mobilization	1	Lump Sum		
1.2	Construct Decontamination Pad	1	Lump Sum		
1.3	Demobilization	1	Lump Sum		
1.4	Stand by time	10 Hrs	Hours		

2.0 UNIT COSTS

Item No.	Description	Quantity	Units	Unit Cost	Extended Cost
2.1*	Deep Holes up to 100 ft				
2.1.1	Drill w. Hollow Stem Augers				
2.1.1.1	Continuous Sampler	200 Ft	Feet		
2.1.1.2	Shelby tube	5	Each		
2.1.1.3	Split Spoon	5	Each		
2.1.1.4	No Sampling	100 Ft	Feet		
2.1.1.5	Pavement Drilling	4 Ft	Feet		

*Bidder may subdivide into smaller depth units.

SCHEDULE OF QUANTITIES AND PRICES - LEVEL D

LIST OF PAY ITEMS AND PRICES

2.0 UNIT COSTS (Cont.)

Item No.	Description	Quantity	Units	Unit Cost	Extended Cost
2.2	Install Deep Wells up to 100 feet	100 Ft	Feet		
2.2a	Install Intermediate Wells up to 50 feet	50 Ft	Feet		
2.2b	Install Shallow Wells up to 25 feet	50 Ft	Feet		
2.3	Grouting Boreholes	500 Ft	Feet		_____
				Total Costs	

SCHEDULE OF QUANTITIES AND PRICES - LEVEL C

LIST OF PAY ITEMS AND PRICES

1.0 LUMP SUM PRICES

Item No.	Description	Quantity	Units	Unit Cost	Extended Cost
1.1	Mobilization	1	Lump Sum		
1.2	Construct Decontamination Pad	1	Lump Sum		
1.3	Demobilization	1	Lump Sum		
1.4	Stand by time	10 Hrs	Hours		

2.0 UNIT COSTS

Item No.	Description	Quantity	Units	Unit Cost	Extended Cost
2.1*	Deep Holes up to 100 ft				
2.1.1	Drill w. Hollow Stem Augers				
2.1.1.1	Continuous Sampler	200 Ft	Feet		
2.1.1.2	Shelby tube	5	Each		
2.1.1.3	Split Spoon	5	Each		
2.1.1.4	No Sampling	100 Ft	Feet		
2.1.1.5	Pavement Drilling	4 Ft	Feet		

*Bidder may subdivide into smaller depth units.

SCHEDULE OF QUANTITIES AND PRICES - LEVEL C

LIST OF PAY ITEMS AND PRICES

2.0 UNIT COSTS (Cont.)

Item No.	Description	Quantity	Units	Unit Cost	Extended Cost
2.2	Install Deep Wells up to 100 feet	100 Ft	Feet		
2.2a	Install Intermediate Wells up to 50 feet	50 Ft	Feet		
2.2b	Install Shallow Wells up to 25 feet	50 Ft	Feet		
2.3	Grouting Boreholes	500 Ft	Feet		_____
				Total Costs	

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February 26, 1992 Z-301

American Testing & Analytical Services, Inc.
875 Fee Fee Road
Maryland Heights, Missouri 63043

Attention: Mr. Richard Mannz

Reference: Chemical Analyses of Soil and Water Samples from the Steelcote Manufacturing Company Facility

Gentlemen:

You have been invited to submit a bid to conduct chemical analyses of soil and water samples from the Steelcote Facility, owned by Niedt Realty and located at One Steelcote Square (near Grand and Chouteau) in the City of St. Louis. Attached to this letter are copies of the Quality Assurance/Quality Control (QA/QC) Plan, a Plan of Study, and a Schedule of Quantities and Prices. Please familiarize yourself with this information as you will be held accountable for the appropriate contents.

Please include with your bid a Statement of Qualifications which demonstrates that:

1. The laboratory quality assurance/quality control is compatible with the enclosed QA/QC Plan. Note that the successful laboratory will have to submit this information prior to award of a contract.

2. The laboratory is qualified to participate in the USEPA Contract Laboratory Program, (CLP) and will employ CLP methods and procedures for the required analyses. In addition, the QA/QC documentation as per CLP is required for all analyses.

3. The laboratory has sufficient capacity to complete analyses and submit results of the

analyses within four (4) weeks of sample delivery. Note that the laboratory must guarantee delivery of analytical results within four (4) weeks.

4. The laboratory is willing to submit to an inspection(s) by Shannon & Wilson personnel and/or representatives of Steelcote Manufacturing Company during the life of the contract.

5. The laboratory will properly dispose of all samples and sample residue and that Shannon & Wilson, Inc. will receive at least 30 days notice prior to any such disposal.

The enclosed Schedule of Quantities identifies the contaminants and the anticipated number of samples. Identify the cost for normal and accelerated turn around times along with the methodolgy to be employed. Also, specify what are normal and accelerated turn around times. Note that the prices are to include delivery of sample containers to Shannon & Wilson's Office, preservatives other than ice, and shipping containers (coolers). Also, note that all of the soil samples will be delivered to your laboratory over a period of 5 days and that water samples will be submitted on a quarterly basis for a period of one year. Include with your bid the method of analyses to be employed. If you wish to comment on or take exception to the form; make recommendations; or, add pay items, do so on a separate sheet and cross reference both the schedule and the attached sheet.

The successful bidder will contract directly with Niedt Realty Company, the owner of the facility. However, please submit your bid and support documents by 5:00 P.M., March 6, 1992 to:

Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Sincerely,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

Enclosures: Schedule of Quantities and Prices
Plan of Study
Quality Assurance/Quality Control Plan

SCHEDULE OF QUANTITIES

Parameters	Water Units	Water Methodology	Water Unit Cost	Soil Units	Soil Methodology	Soil Unit Cost	Extended
Xylene	20			20			
Ethyl Acetate	20			20			
1-Butanol	20			20			
Methyl Ethyl Ketone	20			20			
Toluene	20			20			
Methyl Isobutyl Ketone	20			20			
Butyl Benzyl Phthalate	20			20			
Dibutyl Phthalate	20			20			
2-Ethoxyethanol	20			20			
Cyclohexanone	20			20			
Methanol	20			20			
Carbon Tetrachloride	20			20			
Di(2-Ethylhexyl)Phthalate	20			20			
Phenol	20			20			
2-Methyl-1-propanol	20			20			
Formaldehyde	20			20			
Toluene-2,4-Diisocyanate	20			20			
Benzene	20			20			
Methylene Chloride	20			20			
Nitrosoimino Diethanol	20			20			
Epichlorohydrin	20			20			
Bisphenol A/Epichlorohydrin	20			20			
Cumene	20			20			
Naphthalene	20			20			
Barium (Total)	20			20			
Chromium (Total)	20			20			
Cadmium (Total)	20			20			
Lead (Total)	20			20			
Nickel (Total)	20			20			

Parameters	Water Units	Water Methodology	Water Unit Cost	Soil Units	Soil Methodology	Soil Unit Cost	Extended
Barium (TCLP)	--			20			
Cadmium (TCLP)	--			20			
Chromium (TCLP)	--			20			
Lead (TCLP)	--			20			
Nickel (TCLP)	--			20			

Costs are to include analyses, reporting of results, provision of quality assurance quality control information, provision and delivery of proper sample containers, preservatives other than ice, and shipping containers (coolers).

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February 26, 1992 Z-301

American Interplex Laboratories Corporation
8600 Kanis Road
Little Rock, Arkansas 72204-2322

Attention: Mr. Tom Lieblong

Reference: Chemical Analyses of Soil and Water Samples from the Steelcote Manufacturing Company Facility

Gentlemen:

You have been invited to submit a bid to conduct chemical analyses of soil and water samples from the Steelcote Facility, owned by Niedt Realty and located at One Steelcote Square (near Grand and Chouteau) in the City of St. Louis. Attached to this letter are copies of the Quality Assurance/Quality Control (QA/QC) Plan, a Plan of Study, and a Schedule of Quantities and Prices. Please familiarize yourself with this information as you will be held accountable for the appropriate contents.

Please include with your bid a Statement of Qualifications which demonstrates that:

1. The laboratory quality assurance/quality control is compatible with the enclosed QA/QC Plan. Note that the successful laboratory will have to submit this information prior to award of a contract.

2. The laboratory is qualified to participate in the USEPA Contract Laboratory Program, (CLP) and will employ CLP methods and procedures for the required analyses. In addition, the QA/QC documentation as per CLP is required for all analyses.

3. The laboratory has sufficient capacity to complete analyses and submit results of the

analyses within four (4) weeks of sample delivery. Note that the laboratory must guarantee delivery of analytical results within four (4) weeks.

4. The laboratory is willing to submit to an inspection(s) by Shannon & Wilson personnel and/or representatives of Steelcote Manufacturing Company during the life of the contract.

5. The laboratory will properly dispose of all samples and sample residue and that Shannon & Wilson, Inc. will receive at least 30 days notice prior to any such disposal.

The enclosed Schedule of Quantities identifies the contaminants and the anticipated number of samples. Identify the cost for normal and accelerated turn around times along with the methodolgy to be employed. Also, specify what are normal and accelerated turn around times. Note that the prices are to include delivery of sample containers to Shannon & Wilson's Office, preservatives other than ice, and shipping containers (coolers). Also, note that all of the soil samples will be delivered to your laboratory over a period of 5 days and that water samples will be submitted on a quarterly basis for a period of one year. Include with your bid the method of analyses to be employed. If you wish to comment on or take exception to the form; make recommendations; or, add pay items, do so on a separate sheet and cross reference both the schedule and the attached sheet.

The successful bidder will contract directly with Niedt Realty Company, the owner of the facility. However, please submit your bid and support documents by 5:00 P.M., March 6, 1992 to:

Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Sincerely,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

Enclosures: Schedule of Quantities and Prices
Plan of Study
Quality Assurance/Quality Control Plan

SCHEDULE OF QUANTITIES

Parameters	Water Units	Water Methodology	Water Unit Cost	Soil Units	Soil Methodology	Soil Unit Cost	Extended
Xylene	20			20			
Ethyl Acetate	20			20			
1-Butanol	20			20			
Methyl Ethyl Ketone	20			20			
Toluene	20			20			
Methyl Isobutyl Ketone	20			20			
Butyl Benzyl Phthalate	20			20			
Dibutyl Phthalate	20			20			
2-Ethoxyethanol	20			20			
Cyclohexanone	20			20			
Methanol	20			20			
Carbon Tetrachloride	20			20			
Di(2-Ethylhexyl)Phthalate	20			20			
Phenol	20			20			
2-Methyl-1-propanol	20			20			
Formaldehyde	20			20			
Toluene-2,4-Diisocyanate	20			20			
Benzene	20			20			
Methylene Chloride	20			20			
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Cadmium (Total)	20			20			
Lead (Total)	20			20			
Nickel (Total)	20			20			

Parameters	Units	Water Methodology	Unit Cost	Units	Soil Methodology	Unit Cost	Extended
Barium (TCLP)	--			20			
Cadmium (TCLP)	--			20			
Chromium (TCLP)	--			20			
Lead (TCLP)	--			20			
Nickel (TCLP)	--			20			

Costs are to include analyses, reporting of results, provision of quality assurance quality control information, provision and delivery of proper sample containers, preservatives other than ice, and shipping containers (coolers).

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February 26, 1992 Z-301

Environmental Testing and Certification Corporation
284 Raritan Center Parkway
CN 7808
Edison, New Jersey 08818-7808

Attention: Mr. Robert Walla

Reference: Chemical Analyses of Soil and Water Samples from the Steelcote Manufacturing Company Facility

Gentlemen:

You have been invited to submit a bid to conduct chemical analyses of soil and water samples from the Steelcote Facility, owned by Niedt Realty and located at One Steelcote Square (near Grand and Chouteau) in the City of St. Louis. Attached to this letter are copies of the Quality Assurance/Quality Control (QA/QC) Plan, a Plan of Study, and a Schedule of Quantities and Prices. Please familiarize yourself with this information as you will be held accountable for the appropriate contents.

Please include with your bid a Statement of Qualifications which demonstrates that:

1. The laboratory quality assurance/quality control is compatible with the enclosed QA/QC Plan. Note that the successful laboratory will have to submit this information prior to award of a contract.

2. The laboratory is qualified to participate in the USEPA Contract Laboratory Program, (CLP) and will employ CLP methods and procedures for the required analyses. In addition, the QA/QC documentation as per CLP is required for all analyses.

3. The laboratory has sufficient capacity to complete analyses and submit results of the analyses within four (4) weeks of sample delivery. Note that the laboratory must guarantee delivery of analytical results within four (4) weeks.

4. The laboratory is willing to submit to an inspection(s) by Shannon & Wilson personnel and/or representatives of Steelcote Manufacturing Company during the life of the contract.

5. The laboratory will properly dispose of all samples and sample residue and that Shannon & Wilson, Inc. will receive at least 30 days notice prior to any such disposal.

The enclosed Schedule of Quantities identifies the contaminants and the anticipated number of samples. Identify the cost for normal and accelerated turn around times along with the methodolgy to be employed. Also, specify what are normal and accelerated turn around times. Note that the prices are to include delivery of sample containers to Shannon & Wilson's Office, preservatives other than ice, and shipping containers (coolers). Also, note that all of the soil samples will be delivered to your laboratory over a period of 5 days and that water samples will be submitted on a quarterly basis for a period of one year. Include with your bid the method of analyses to be employed. If you wish to comment on or take exception to the form; make recommendations; or, add pay items, do so on a separate sheet and cross reference both the schedule and the attached sheet.

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Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Sincerely,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

Enclosures: Schedule of Quantities and Prices
Plan of Study
Quality Assurance/Quality Control Plan

SCHEDULE OF QUANTITIES

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Methylene Chloride	20			20			
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Epichlorohydrin	20			20			
Bisphenol A/Epichlorohydrin	20			20			
Cumene	20			20			
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Barium (Total)	20			20			
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Cadmium (Total)	20			20			
Lead (Total)	20			20			
Nickel (Total)	20			20			

Parameters	Units	Water Methodology	Unit Cost	Units	Soil Methodology	Unit Cost	Extended
Barium (TCLP)	--			20			
Cadmium (TCLP)	--			20			
Chromium (TCLP)	--			20			
Lead (TCLP)	--			20			
Nickel (TCLP)	--			20			

Costs are to include analyses, reporting of results, provision of quality assurance quality control information, provision and delivery of proper sample containers, preservatives other than ice, and shipping containers (coolers).

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February 26, 1992 Z-301

Industrial Testing Laboratories, Inc.
2350 S. Seventh Street
St. Louis, Missouri 63104-4296

Reference: Chemical Analyses of Soil and Water Samples from the Steelcote Manufacturing Company Facility

Gentlemen:

You have been invited to submit a bid to conduct chemical analyses of soil and water samples from the Steelcote Facility, owned by Niedt Realty and located at One Steelcote Square (near Grand and Chouteau) in the City of St. Louis. Attached to this letter are copies of the Quality Assurance/Quality Control (QA/QC) Plan, a Plan of Study, and a Schedule of Quantities and Prices. Please familiarize yourself with this information as you will be held accountable for the appropriate contents.

Please include with your bid a Statement of Qualifications which demonstrates that:

1. The laboratory quality assurance/quality control is compatible with the enclosed QA/QC Plan. Note that the successful laboratory will have to submit this information prior to award of a contract.

2. The laboratory is qualified to participate in the USEPA Contract Laboratory Program, (CLP) and will employ CLP methods and procedures for the required analyses. In addition, the QA/QC documentation as per CLP is required for all analyses.

3. The laboratory has sufficient capacity to complete analyses and submit results of the

analyses within four (4) weeks of sample delivery. Note that the laboratory must guarantee delivery of analytical results within four (4) weeks.

4. The laboratory is willing to submit to an inspection(s) by Shannon & Wilson personnel and/or representatives of Steelcote Manufacturing Company during the life of the contract.

5. The laboratory will properly dispose of all samples and sample residue and that Shannon & Wilson, Inc. will receive at least 30 days notice prior to any such disposal.

The enclosed Schedule of Quantities identifies the contaminants and the anticipated number of samples. Identify the cost for normal and accelerated turn around times along with the methodolgy to be employed. Also, specify what are normal and accelerated turn around times. Note that the prices are to include delivery of sample containers to Shannon & Wilson's Office, preservatives other than ice, and shipping containers (coolers). Also, note that all of the soil samples will be delivered to your laboratory over a period of 5 days and that water samples will be submitted on a quarterly basis for a period of one year. Include with your bid the method of analyses to be employed. If you wish to comment on or take exception to the form; make recommendations; or, add pay items, do so on a separate sheet and cross reference both the schedule and the attached sheet.

The successful bidder will contract directly with Niedt Realty Company, the owner of the facility. However, please submit your bid and support documents by 5:00 P.M., March 6, 1992 to:

Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Sincerely,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

Enclosures: Schedule of Quantities and Prices
Plan of Study
Quality Assurance/Quality Control Plan

SCHEDULE OF QUANTITIES

Parameters	Water Units	Water Methodology	Water Unit Cost	Soil Units	Soil Methodology	Soil Unit Cost	Extended
Xylene	20			20			
Ethyl Acetate	20			20			
1-Butanol	20			20			
Methyl Ethyl Ketone	20			20			
Toluene	20			20			
Methyl Isobutyl Ketone	20			20			
Butyl Benzyl Phthalate	20			20			
Dibutyl Phthalate	20			20			
2-Ethoxyethanol	20			20			
Cyclohexanone	20			20			
Methanol	20			20			
Carbon Tetrachloride	20			20			
Di(2-Ethylhexyl)Phthalate	20			20			
Phenol	20			20			
2-Methyl-1-propanol	20			20			
Formaldehyde	20			20			
Toluene-2,4-Diisocyanate	20			20			
Benzene	20			20			
Methylene Chloride	20			20			
Nitrosoimino Diethanol	20			20			
Epichlorohydrin	20			20			
Bisphenol A/Epichlorohydrin	20			20			
Cumene	20			20			
Naphthalene	20			20			
Barium (Total)	20			20			
Chromium (Total)	20			20			
Cadmium (Total)	20			20			
Lead (Total)	20			20			
Nickel (Total)	20			20			

Parameters	Units	Water Methodology	Unit Cost	Units	Soil Methodology	Unit Cost	Extended
Barium (TCLP)	--			20			
Cadmium (TCLP)	--			20			
Chromium (TCLP)	--			20			
Lead (TCLP)	--			20			
Nickel (TCLP)	--			20			

Costs are to include analyses, reporting of results, provision of quality assurance quality control information, provision and delivery of proper sample containers, preservatives other than ice, and shipping containers (coolers).

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Over 35 Years of Excellence

11500 Olive Boulevard, Suite 276 • St. Louis, MO 63141-7126 • (314) 872-8170 • Fax: (314) 872-8178

February 26, 1992 Z-301

Hygienics Laboratory
University of Iowa
Oakdale Hall
Iowa City, Iowa 52242

Attention: Ms. Lynn Hudachek

Reference: Chemical Analyses of Soil and Water Samples from the Steelcote Manufacturing Company Facility

Gentlemen:

You have been invited to submit a bid to conduct chemical analyses of soil and water samples from the Steelcote Facility, owned by Niedt Realty and located at One Steelcote Square (near Grand and Chouteau) in the City of St. Louis. Attached to this letter are copies of the Quality Assurance/Quality Control (QA/QC) Plan, a Plan of Study, and a Schedule of Quantities and Prices. Please familiarize yourself with this information as you will be held accountable for the appropriate contents.

Please include with your bid a Statement of Qualifications which demonstrates that:

1. The laboratory quality assurance/quality control is compatible with the enclosed QA/QC Plan. Note that the successful laboratory will have to submit this information prior to award of a contract.

2. The laboratory is qualified to participate in the USEPA Contract Laboratory Program, (CLP) and will employ CLP methods and procedures for the required analyses. In addition, the QA/QC documentation as per CLP is required for all analyses.

3. The laboratory has sufficient capacity to complete analyses and submit results of the

analyses within four (4) weeks of sample delivery. Note that the laboratory must guarantee delivery of analytical results within four (4) weeks.

4. The laboratory is willing to submit to an inspection(s) by Shannon & Wilson personnel and/or representatives of Steelcote Manufacturing Company during the life of the contract.

5. The laboratory will properly dispose of all samples and sample residue and that Shannon & Wilson, Inc. will receive at least 30 days notice prior to any such disposal.

The enclosed Schedule of Quantities identifies the contaminants and the anticipated number of samples. Identify the cost for normal and accelerated turn around times along with the methodolgy to be employed. Also, specify what are normal and accelerated turn around times. Note that the prices are to include delivery of sample containers to Shannon & Wilson's Office, preservatives other than ice, and shipping containers (coolers). Also, note that all of the soil samples will be delivered to your laboratory over a period of 5 days and that water samples will be submitted on a quarterly basis for a period of one year. Include with your bid the method of analyses to be employed. If you wish to comment on or take exception to the form; make recommendations; or, add pay items, do so on a separate sheet and cross reference both the schedule and the attached sheet.

The successful bidder will contract directly with Niedt Realty Company, the owner of the facility. However, please submit your bid and support documents by 5:00 P.M., March 6, 1992 to:

Donald J. McQueen
Vice President
Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141

Sincerely,

SHANNON & WILSON, INC.

Donald J. McQueen, P.G.
Vice President

LCR:DJM/ki

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Chromium (TCLP)	--			20			
Lead (TCLP)	--			20			
Nickel (TCLP)	--			20			

Costs are to include analyses, reporting of results, provision of quality assurance quality control information, provision and delivery of proper sample containers, preservatives other than ice, and shipping containers (coolers).

ADMINISTRATIVE ORDER OF CONSENT

SHANNON & WILSON, INC.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141-7126
(314) 872-8170

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

STEELCOTE MANUFACTURING COMPANY ST. LOUIS, MISSOURI, AND NIEDT REALTY COMPANY ST. LOUIS, MISSOURI, **Respondents.** Proceeding under Section 3013 of the Resource Conservation and Recovery Act OF 1976, as amended, 42 U.S.C. § 6934.	**ADMINISTRATIVE ORDER ON CONSENT** Docket No. VII-91-H-0025

TABLE OF CONTENTS

I. PRELIMINARY STATEMENT

1. This Administrative Order on Consent ("Order") is entered into by Steelcote Manufacturing Company, a Missouri corporation, Niedt Realty Company, a Missouri corporation (hereinafter individually referred to as "Steelcote" and "Niedt Realty", respectively, and collectively as "Respondents"), and the United States Environmental Protection Agency, Region VII ("EPA") pursuant to Section 3013 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, and the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. § 6934 (hereinafter "RCRA").

2. The authority to enter into orders pursuant to Section 3013 of RCRA, 42 U.S.C. § 6934, was delegated by the Administrator of the United States Environmental Protection Agency to the Regional Administrator of EPA Region VII, by EPA Delegation No. 8-20, dated March 6, 1986.

3. By entering into this Order, Respondents admit the jurisdiction of EPA to issue this Order, agree to undertake all actions provided for herein, and consent to be bound by the requirements set forth herein.

4. Nothing in this Order shall be construed as or deemed to be an admission of responsibility, fault, or liability by Respondents in connection with the subject matter of this Order.

II. PARTIES BOUND

5. This Order shall apply to and be binding upon Respondents and their successors and assigns.

6. No change in Respondents' corporate status or change in the ownership or operation of the Facility (as defined below) shall alter Respondents' obligations hereunder.

7. Respondents shall provide a copy of this Order to all contractors, subcontractors, consultants, and laboratories retained to conduct any work herein called for on or before the date of such retention and shall condition all such contracts on compliance with the terms of this Order.

8. Respondents shall give notice of this Order to any successor in interest prior to transferring ownership or operation of the Facility and shall notify EPA at least thirty (30) days prior to any such transfer.

III. STATEMENT OF PURPOSE

9. The objectives of the parties in entering into this Order are to conduct such monitoring, testing, analysis, and reporting with respect to hazardous waste that is present at, or that has been released from, the Facility, as is necessary to ascertain the nature and extent of any hazard to human health or the environment presented by the presence or release of such hazardous waste.

IV. FINDINGS OF FACT

10. Niedt Realty is a corporation organized and existing pursuant to the laws of the State of Missouri.

11. Niedt Realty is the owner of certain real property located at One Steelcote Square (formerly known as 3418 Gratiot Street) in St. Louis, Missouri (the "Real Property").

12. Steelcote is a corporation organized and existing pursuant to the laws of the State of Missouri.

13. Steelcote is the owner of improvements located at the Real Property (the "Improvements").

14. The Real Property and Improvements together constitute the Facility.

15. Steelcote engages in the business at the Facility of manufacturing industrial maintenance and architectural coatings for industrial and professional purposes and manufacturing swimming pool products and marine coatings for retail purposes.

16. Steelcote, as a result of activities described in Paragraph 15, generates hazardous waste as defined in Section 1004(5) of RCRA, 42 U.S.C. § 6903(5).

17. On or about August 15, 1980, Steelcote notified EPA, pursuant to Section 3010(a) of RCRA, 42 U.S.C. § 6930(a), that it generated hazardous waste listed as D001, K078, U220, and U239 as defined at 40 C.F.R. §§ 261.21, 262.32 and 261.33. Steelcote was assigned EPA Identification Number MOD006275036 for the Facility.

18. Hazardous wastes, which are generated at several areas within the Facility, are stored in various satellite and main storage areas onsite.

19. On or about August 29, 1989, EPA conducted a Compliance Evaluation Inspection ("CEI") at the Facility. As a

result of this inspection it was ascertained that xylene, toluene and methyl ethyl ketone were also generated at the Facility. Xylene is listed as a hazardous waste in 40 C.F.R. § 261.31, and has the EPA hazardous waste number F003. Toluene and methyl ethyl ketone are listed as hazardous wastes in 40 C.F.R. § 261.31, and have the EPA hazardous waste number F005.

20. During a CEI conducted on March 6, 1991, EPA noted several areas of stained soils, ruptured drums, and apparent releases of paint-related waste in the south outside courtyard. EPA observed an equipment access hole in the floor on the east side of the distillation room which bore evidence of past releases of paint-related materials. The inspector also noted stained floors and evidence of spills in other areas of the Facility.

21. During the CEI of March 6, 1991, EPA observed the location of a December 21, 1990 removal of an underground storage tank which had held solvent since 1971. Steelcote produced sampling results for the soil surrounding the underground tank. These results confirm soil contamination by 14.3 parts per million (ppm) toluene, 65.9 ppm ethyl benzene and 305 ppm xylene.

V. CONCLUSIONS OF LAW

22. Respondent Steelcote Manufacturing Company is an "owner" and "operator" of the Facility as referred to in Section 3013(a) of RCRA, 42 U.S.C. § 6934(a), and defined at 40 C.F.R. § 260.10.

23. Respondent Niedt Realty Company is an "owner" of the Facility as referred to in Section 3013(a) of RCRA, 42 U.S.C. § 6934(a), and defined at 40 C.F.R. § 260.10.

24. The Real Property and Improvements are a "facility" or "site" as referred to in Section 3013(a)(1) of RCRA, 42 U.S.C. § 6934(a)(1), and as "facility" is defined at 40 C.F.R. § 260.10.

VI. DETERMINATIONS

25. Based upon the foregoing Findings of Fact and Conclusions of Law, pursuant to Section 3013 of RCRA, 42 U.S.C. § 6934, the Regional Administrator has determined that:

a. "Hazardous waste", as defined by Section 1004(5) of RCRA, 42 U.S.C. § 6903(5), is present at, or has been released from, the Facility;

b. The presence of hazardous waste at, or the release of hazardous waste from, the Facility may present a substantial hazard to human health or the environment; and

c. The monitoring, testing, analysis, and reporting required to be conducted by Respondents pursuant to this Order is reasonable to ascertain the nature and extent of any such hazard.

VII. ORDER

26. Pursuant to Section 3013 of RCRA, 42 U.S.C. § 6934, and in order to ascertain the nature and extent of any hazard to human health or the environment at the Facility, it is hereby AGREED TO BY THE PARTIES AND ORDERED that Respondents shall, within thirty (30) calendar days of the effective date of this Order, submit a written Proposal to EPA describing the

monitoring, testing, analysis, and reporting that Respondents propose to perform in order to ascertain the nature and extent of the hazard, if any, that may be presented to human health or the environment by any hazardous waste that is present at, or has been released from, the Facility. Respondents are hereby ORDERED to implement such Proposal upon receipt of written approval from EPA. Such Proposal shall contain, but is not limited to, the following:

a. A plan incorporating a phased approach for determining whether hazardous wastes have leaked or are leaking from any past or present storage areas at the Facility, including above ground and underground storage tanks. The focus of this plan shall be the contaminants of concern ("COCs"). The COCs are those hazardous wastes and those hazardous constituents listed in Appendix VIII of 40 C.F.R. Part 261 that are present in materials, or degradation products of materials, used or produced by Steelcote. This plan shall provide, and include a timetable, for the subsurface investigation of the Facility which shall include soil sampling and installation of a groundwater monitoring program, including proposals as to locations, depth, and construction thereof, designed to monitor groundwater elevation and water quality.

b. A plan and timetable for the determination of the horizontal and vertical permeabilities of the uppermost aquifer and the nature of the aquitards, or barriers, including a determination of the direction and velocity of groundwater flow

in the uppermost water-bearing zones in the area likely to be affected by migration of COCs from the Facility. The plan shall consider means to determine areas of discharge and recharge of groundwater in all areas likely to be affected by the migration of hazardous wastes from the Facility.

c. A sampling and analysis plan for monitoring groundwater at or near the Facility which describes analysis parameters, frequency of sampling, and procedures and quality assurance measures for sampling and analyzing COCs. The plan shall provide that groundwater be sampled and analyzed at least quarterly for one year. Any COC not detected in any quarterly sampling period shall be eliminated from future sampling and analysis.

d. A plan and timetable to collect soil samples of appropriate size, depth, and location to determine the nature and extent of contamination of the surface and of the soil column above the groundwater table at the Facility by hazardous waste.

e. A plan, including timeframes, for determining the extent of any hazard presented by hazardous waste that may have been released to drainage ditches, surface waters, or sediments at the Facility. This plan shall specifically include sampling of water, sediment, and soils, both on and off-site (if necessary), sufficient to document the extent of contamination by hazardous wastes that may have resulted from past events such as precipitation and resulting run-off.

f. A Quality Assurance and Quality Control (QA/QC) plan for the performance of all sampling and analysis under the Proposal, which shall include as an appendix the QA/QC plan of each contract laboratory used during the investigations required by this Order. Further, the Proposal shall include the procedures by which Respondents will maintain, verify and record the chain of custody of all samples.

g. A schedule for the performance of all work required by this Order, beginning with the point in time EPA approves the Proposal. **In no event shall the time from the initiation of the EPA-approved Proposal to the submittal of a final report exceed fifteen (15) months.**

h. **A schedule for the submission of the results of all** sampling, testing and analysis to EPA in a complete and expeditious manner.

27. **Upon completion of its review of the Proposal, EPA will notify Respondents that it:**

a. approves the Proposal;

b. approves the Proposal with conditions; or

c. disapproves the Proposal.

If the Proposal is disapproved, EPA will provide comments to Respondents regarding the deficiencies in the Proposal. Within fifteen (15) calendar days of receipt of EPA's notification of disapproval, or such other time as agreed to by the parties, Respondents shall resubmit the Proposal to EPA for approval, addressing EPA's comments. Upon receipt of EPA's notification of

approval or notification of approval with conditions, Respondents shall implement the Proposal in accordance with the terms and schedules contained therein.

28. Respondents shall submit monthly reports to EPA describing activities completed each month in implementing the terms and schedules in the EPA-approved Proposal. Respondents shall submit each such monthly report by no later than the 15th day of each calendar month.

VIII. NOTICES

29. The Proposal, and all reports and correspondence submitted by Respondents pursuant to the terms of this Order, shall be submitted to:

Cynthia Hutchison
Environmental Engineer
WSTM/RCRA/RCOM
U.S. Environmental Protection Agency
726 Minnesota Avenue
Kansas City, Kansas 66101

30. All communication and correspondence to Respondents pursuant to this Order shall be directed to:

Douglas A. Niedt, President
Steelcote Manufacturing Company
One Steelcote Square
St. Louis, Missouri 63103

with a copy to:

Alphonse McMahon, Esq.
Peper, Martin, Jensen, Maichel and Hetlage
720 Olive Street, 24th Floor
St. Louis, Missouri 63101

IX. ADDITIONAL WORK

31. EPA may determine that monitoring, analysis, testing, or reporting in addition to that specifically set forth herein or in the approved Proposal is necessary to meet the objectives of this Order and Section 3013 of RCRA, 42 U.S.C. § 6934. If EPA so determines, it will advise Respondents in writing of the nature of the additional tasks and the basis for EPA's determination. Respondents shall either: (i) undertake, perform, and complete all such additional tasks in accordance with the standards, specifications, and schedules determined or approved by EPA, or (ii) advise EPA in writing within five (5) working days of their refusal to undertake the additional tasks and the reasons for such refusal and initiate the dispute resolution process set forth in Section XX of this Order. The time period for initiation of dispute resolution pertaining to additional work shall run from the date Respondents receive written notice from EPA of EPA's determination that additional work is necessary to satisfy the purposes of this Order.

X. ACCESS

32. Respondents shall provide EPA with access to the Facility such that EPA and its authorized representatives are able to enter and move freely about all such property upon which any activities are being conducted or have been conducted pursuant to this Order at all reasonable times for, but not limited to, the following purposes:

a. Inspecting and copying records, files, photographs, operating logs, contracts, and other documents relating to this Order;

b. Reviewing the status of activities being conducted pursuant to this Order;

c. Collecting such samples or conducting such tests as EPA determines are necessary or desirable to monitor compliance with the terms of this Order or to protect human health or the environment;

d. Using sound, optical or other types of recording equipment to record activities which have been or are being conducted pursuant to this Order; and

e. Verifying data and other information submitted by Respondents pursuant to this Order.

33. Respondents shall notify EPA not less than fifteen (15) calendar days prior to any sample collection, well installation, equipment installation, construction, or other field activity specified in the Proposal. Prior to disposal of any samples, Respondents shall give EPA twenty (20) calendar days written notice and the opportunity to take possession of such samples.

34. To the extent that any work required by this Order must be done on property not owned or controlled by Respondents, Respondents shall:

a. Identify each such property and the name, address, and telephone number of the current owner of the property and the name, address, and telephone number of the individual with whom

Respondents have communicated regarding access to the property, if different from the current owner.

b. Use best efforts to obtain written access agreements for each such property within fifteen (15) calendar days of approval by EPA of the Proposal. Such access agreements must be conditioned so as to allow Respondents and EPA access to the property necessary to conduct the actions herein required. For the purposes of this Section, "best efforts" shall include, but are not limited to, the payment of reasonable compensation in consideration of access.

c. No later than thirty (30) calendar days after receipt of EPA approval of the Proposal, Respondents shall notify EPA as to status of its efforts to secure access to such property.

d. In the event that access agreements are not obtained in accordance with the schedule contained in the Proposal, Respondents shall notify EPA in writing within ten (10) calendar days of such failure. In such notification, Respondents shall describe both the lack of agreement and the efforts made to obtain access.

XI. FINANCIAL ASSURANCE

35. Within forty-five (45) days of the effective date of this Order, Respondents shall submit to EPA a cost estimate for implementation of this Order. Said cost estimate shall include direct and indirect capital costs, operation and maintenance costs, and any other costs attributable to implementation of the

requirements of this Order.

36. Within sixty (60) days of the effective date of this Order, Respondents shall submit to EPA documentation of financial assurance in the amount equal to the cost estimate submitted pursuant to Paragraph 35 of this Section to guarantee completion of the work required pursuant to this Order. Such financial assurance shall be in any one or a combination of the following and shall be consistent with the provisions of this Order and 40 C.F.R. Part 264, Subpart H:

(a) A performance or surety bond;

(b) A letter of credit;

(c) A trust fund; or

(d) A guarantee to perform the work set forth in the Proposal approved by EPA by one or more parent corporation or subsidiary, or by one or more unrelated corporations that have a substantial business relationship with at least one of the Respondents.

(e) A demonstration that the Respondents satisfy the requirements of 40 C.F.R. § 264.143(f).

37. In the event that Respondents fail to perform the work under this Order (after exhausting the procedures under Section XX (Dispute Resolution), if invoked), EPA may, three (3) days after providing notice to Respondents, undertake to complete such tasks, utilizing the proceeds of the foregoing financial assurance.

XII. RECORD PRESERVATION

38. Respondents shall, without regard to any document retention policy to the contrary, preserve during the pendency of this Order and for a minimum of six (6) years after its termination, all records and documents in their possession, custody, or control which relate in any way to work performed pursuant hereto and which have not previously been submitted to EPA. At the end of this six-year period, Respondent shall notify EPA at least sixty (60) calendar days prior to the destruction of any such record or document. Respondents shall, if requested by EPA, provide to EPA the records or documents or copies thereof.

XIII. CONFIDENTIAL BUSINESS INFORMATION

39. Respondents may assert a business confidentiality claim covering all or part of the information submitted pursuant to this Order. The information covered by such a claim will be disclosed by EPA only to the extent and by the procedures specified in 40 C.F.R. Part 2, Subpart B. Such a claim may be made by placing on or attaching to the information, at the time it is submitted to EPA, a cover sheet, stamped or typed legend, or other suitable form of notice, employing language such as "trade secret," "proprietary," or "company confidential." Allegedly confidential portions of otherwise non-confidential documents should be clearly identified and may be submitted separately to facilitate identification and handling by EPA. If confidential treatment is sought only until a certain date or the occurrence of a certain event, the notice should so state. If no

such claim accompanies the information when it is received by EPA, it may be made available to the public without further notice to Respondents.

XIV. OTHER APPLICABLE LAWS

40. All actions required to be taken pursuant hereto shall be undertaken in accordance with the requirements of all applicable local, state and federal laws and regulations, including, but not limited to, any permitting or licensing requirements.

XV. OPPORTUNITY TO CONFER

41. Respondents may confer with EPA at any time prior to submittal of the Proposal. After submittal of the Proposal, Respondents will be afforded an opportunity to confer with EPA on a date specified by EPA to discuss the terms of the Proposal. Following this conference and after review, modification (if any), and approval of the Proposal by EPA, Respondents shall forthwith conduct, carry out and implement the monitoring, testing, analysis, and reporting requirements described in the Proposal according to its approved terms and schedules.

XVI. INDEMNIFICATION OF THE UNITED STATES

42. Respondents agree to indemnify and save and hold the United States Government, its agencies, departments, agents, and employees, harmless from any and all claims or causes of action arising from or on account of acts or omissions of Respondents or their officers, employees, receivers, trustees, agents, contractors, subcontractors, or assigns, in carrying out any

activities pursuant to this Order. EPA is not, and shall not be represented to be, a party to any contract entered into by Respondents to carry out activities pursuant to this Order.

XVII. LIABILITY

43. Subject to the dispute resolution provisions of Section XX hereof, if EPA determines that Respondents are not able to conduct the activities required by this Order in a satisfactory manner, or to conduct the activities contained in the approved Proposal, or if any actions carried out by Respondents in the performance of any work hereunder are deemed unsatisfactory, then EPA may conduct such actions deemed reasonable by EPA to ascertain the nature and extent of any hazard at the Facility presented by the presence or release of hazardous waste.

44. Respondents may then be ordered to reimburse EPA for the costs of such activity pursuant to Section 3013(d) of RCRA, 42 U.S.C. § 6934(d). If Respondents fail or refuse to comply with the terms of this Order, EPA may commence a civil action to require compliance with the Order and to assess a civil penalty, not to exceed Five Thousand Dollars ($5,000) per Respondent, for each day during which such failure or refusal occurs.

XVIII. EFFECTIVE DATE AND SUBSEQUENT MODIFICATION

45. The effective date of this Order shall be the date it is signed by the Regional Administrator, EPA Region VII.

46. This Order may be amended by mutual agreement of EPA and Respondents. Any such amendments shall be in writing and shall be effective when such amendments are signed by the Regional Administator, EPA Region VII.

47. The Proposal and any reports, plans, specifications, schedules, and attachments required by this Order shall, upon written approval by EPA, be deemed incorporated into this Order.

48. No informal advice, guidance, suggestions, or comments by the EPA regarding reports, plans, specifications, schedules, and any other writing submitted by Respondents may be construed as relieving Respondents of their obligations to obtain whatever formal approval as may be required by this Order.

XIX. RESERVATION OF RIGHTS

49. Nothing herein shall constitute or be construed as a release from any claim, cause of action, or demand in law or equity that EPA may have against any person, firm, partnership, or corporation for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant found at, taken to, or taken from the Facility.

50. Notwithstanding compliance with the terms of this Order, EPA may request that Respondents take further action as necessary to respond to releases at the Facility. EPA expressly reserves all rights it may have to request that Respondents perform tasks in addition to those detailed in this Order. EPA

reserves the right to expend and recover funds pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601-9675, as amended ("CERCLA"), and to take any enforcement action pursuant to RCRA, CERCLA, and/or seek injunctive relief, monetary penalties, and/or punitive damages for any violation of law or this Order.

51. Nothing in this Order shall constitute or be deemed a waiver by Respondents of any, and Respondents hereby reserve all, rights, claims, causes of actions, and defenses Respondents may have.

XX. DISPUTE RESOLUTION

52. If Respondents disagree, in whole or in part, with any EPA disapproval or other decision or directive made by EPA pursuant to this Order, Respondents shall notify EPA in writing within ten (10) working days of receipt of EPA's disapproval, decision, or directive. Said notice shall set forth the specific points of the dispute, the position Respondents maintain should be adopted as consistent with the requirements of this Order, the factual and legal bases for Respondents' position, and all matters they deem necessary for EPA's consideration. EPA and Respondents shall then have an additional fourteen (14) calendar days from EPA's receipt of Respondents' objections, or such other period of time as the parties may agree, to attempt to resolve the dispute informally. If agreement is reached, the resolution shall be reduced to writing, signed by each party and incorporated into this Order. If the parties are unable to reach

agreement within this period of informal discussion, Respondents may submit their position in writing to the Director of the Waste Management Division of EPA Region VII (the "Division Director"), within ten (10) calendar days thereafter. EPA will then have ten (10) calendar days to reply to Respondents' position. Other than for routine, periodic reports, neither party shall engage in ex parte communications with the Division Director regarding the basis of the dispute subsequent to the submission of written positions and prior to the Division Director's decision resolving the dispute. The Division Director will provide a written statement of his or her decision regarding the disputed matter to the parties. The decision of the Division Director shall be binding on the parties and shall be incorporated herein.

53. Invoking the dispute resolution procedure described herein shall not excuse, toll, or suspend any compliance obligation or deadline required pursuant to this Order during the pendency of the dispute resolution process other than the obligation or deadline subject to dispute resolution or those agreed by EPA to be directly related thereto.

54. Notwithstanding any other provision of this Order, no action or decision by EPA pursuant to this Order, including without limitation decisions of the Division Director, shall constitute final agency action giving rise to any rights to judicial review prior to EPA's initiation of judicial action to compel Respondents' compliance with the requirements of this Order.

XXI. FORCE MAJEURE

55. Respondents shall perform the requirements of this Order within the time limits set forth herein, unless the performance is prevented or delayed by events which constitute a "force majeure." A force majeure is defined as any event arising from causes not foreseeable and beyond Respondents' control, including their consultants and contractors, which could not be overcome by due diligence and which delays or prevents performance by a date required by this Order. Such events do not include unanticipated or increased costs of performance, changed economic circumstances, normal precipitation events, or failure to obtain federal, state, or local permits.

56. Respondents shall notify EPA in writing within ten (10) calendar days after they become aware of events which Respondents know or should know constitute a force majeure. Such notice shall include an estimate of the anticipated length of delay, including necessary demobilization and remobilization, a description of the cause of the delay and the measures taken or to be taken to minimize the delay, and an estimated timetable for implementation of these measures. Respondents shall adopt all reasonable measures to avoid and minimize the delay. Failure to comply with the notice provision of this Section shall constitute a waiver of Respondents' right to assert a force majeure.

57. If EPA determines that the delay has been or will be caused by a force majeure, the time for performance for that element of work may be extended, upon EPA approval, for a period

equal to the delay resulting from such circumstances. This shall be accomplished through written amendment to this Order pursuant to Section XVIII (Effective Date and Subsequent Modification). Unless expressly provided in such written amendment, such extension shall not alter the schedule for performance or completion of other tasks required by this Order. If EPA and Respondents cannot agree that any delay or failure has been or will be caused by a force majeure, or if there is no agreement on the length of the extension, this dispute shall be resolved in accordance with the dispute resolution provisions of Section XX hereof.

XXII. DELAY IN PERFORMANCE

58. Unless there has been a written modification of a compliance date by EPA or an excusable delay as defined under Section XXI (Force Majeure), if Respondents fail to meet the following requirements of Section VII (Order), Respondents shall pay to EPA the following stipulated penalties. Compliance by Respondents shall include completion of an activity under this Order or any proposal or plan approved under this Order in an acceptable manner and within the specified time schedules in and approved under this Order.

a. For failure to submit the Proposal described in Section VII (Order) hereof within the time specified:

i. $500 per day for the first through seventh days of noncompliance.

ii. $1,000 per day for the eighth through thirtieth days of noncompliance; and

iii. $2,000 per day for the thirty-first day and each succeeding day of noncompliance thereafter; and

b. For failure to submit a monthly progress report called for in Section VII (Order), Paragraph 28 hereof within the time specified:

i. $50 per day for the first through seventh days of noncompliance;

ii. $100 per day for the eighth through fourteenth days of noncompliance; and

iii. $350 per day for the fifteenth day and each succeeding day of noncompliance thereafter.

59. All penalties shall begin to accrue on the day following the date that complete performance is due or a violation occurs and shall continue to accrue through the final day of noncompliance. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Order.

60. All penalties owed under this Section shall be due within ten (10) working days of receipt by Respondents of written demand by EPA for payment thereof. Interest shall begin to accrue on the unpaid balance at the end of this ten-day period at the rate established by the Department of the Treasury pursuant to 31 U.S.C. § 3717 and 4 C.F.R. § 102.13. Interest will accrue on the unpaid balance until such penalties and

interest have been paid in full and will be compounded annually.

61. All penalties shall be paid by certified or cashier's check made payable to the Treasurer of the United States, and shall be remitted to:

Mellon Bank
EPA Region VII
(Comptroller Branch)
P.O. Box 360748M
Pittsburgh, Pennsylvania 15251

62. All payments shall reference Respondents' names and addresses and the EPA docket number, and shall indicate that they are in payment of stipulated penalties. A copy of the transmittal of payment shall concurrently be sent to the EPA contact specified in Section VIII (Notices) hereof.

63. Respondents may dispute EPA's right to the stated amount of penalties by invoking the dispute resolution procedures of Section XX hereof. Penalties shall accrue but need not be paid during the dispute resolution period. Penalties shall be paid when the dispute is resolved by agreement or by a decision of EPA pursuant to the dispute resolution procedures of Section XX hereof.

64. The stipulated penalties set forth in this Section XXII do not preclude EPA from pursuing any other remedies or sanctions which may be available to EPA by reason of Respondents' failure to comply with any of the requirements of this Order, nor shall payment of said penalties relieve Respondents of the responsibility to comply with this Order.

XXIII. ENFORCEMENT

65. Respondents are hereby advised that the Regional Administrator of EPA Region VII may commence a civil action against any person who fails or refuses to comply with this Order. Respondents are hereby advised that such action would be brought in United States District Court pursuant to 42 U.S.C. § 6934(e) to require compliance with this Order and to assess a civil penalty not to exceed Five Thousand ($5,000.00) dollars, per Respondent, for each day during which such failure or refusal occurs.

66. If the Regional Administrator of EPA Region VII determines that Respondents are not able to undertake or satisfactorily complete any action required by this Order or deems any such action carried out by Respondents to be unsatisfactory, then he may undertake or authorize a state or local authority or other person to undertake and complete any such action and enter an Order requiring Respondents to reimburse EPA or other authority or person for the cost thereof.

XXIV. TERMINATION AND SATISFACTION

67. The provisions of this Order shall be deemed satisfied by Respondents on written notice from the EPA that Respondents have demonstrated that all of the terms of this Order including any additional work which the EPA may determine to be necessary pursuant to Section IX of this Order, have been completed to the satisfaction of EPA.

STEELCOTE MANUFACTURING CO.,
A Missouri corporation

9-27-91
Date

Douglas A. Niedt
President

NIEDT REALTY COMPANY
A Missouri corporation

9-27-91
Date

Douglas A. Niedt
President

9-30-91
Date

David A. Hoefer
Assistant Regional Counsel
Environmental Protection Agency
Region VII

IT IS SO ORDERED:

9-30-91
Date

Morris Kay
Regional Administrator
Environmental Protection Agency
Region VII

QA/QC PLAN

SHANNON & WILSON, INC.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141-7126
(314) 872-8170

QA/QC PROGRAM

STEELCOTE FACILITY INVESTIGATION
QUALITY ASSURANCE/QUALITY CONTROL PLAN

1.0 INTRODUCTION

1.1 Purpose

This Quality Assurance/Quality Control Plan (QA/QC) is an integral part of the Plan of Study Scope of Work. Its purpose is to insure that the proper sampling, sample preparation, and chain of custody is applied and documented for this project.

The scope of this plan is based on U.S. Environmental Protection Agency (EPA) guidelines contained in "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," EPA, QAMS-005/80, February 1983. Field QA procedures are developed in the body of this document. Laboratory QA procedures are included in terms of minimum requirements for the selected laboratory. Laboratory analyses will be performed under a subcontract by a laboratory included in the USEPA Contract Laboratory Program. The laboratory QA/QC program will be appended to this document when the laboratory selection is made.

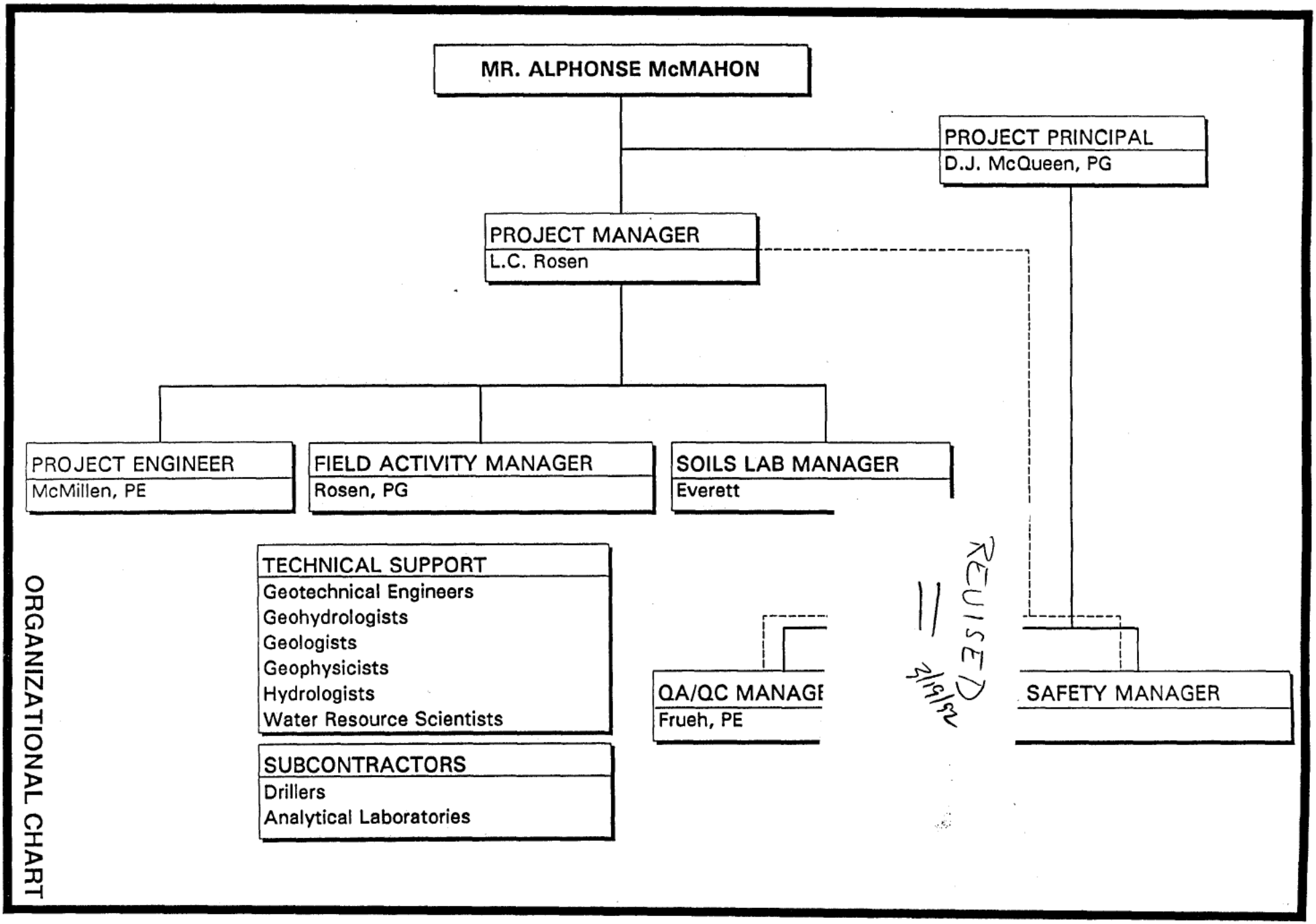
1.2 Project Organizations and Responsibilities

The investigation will be conducted by Shannon & Wilson, Inc. under the direction of Mr. Alphonse McMahon, Attorney for Steelcote Manufacturing Company.

The various organizations and their respective responsibilities follow. Specific individuals are mentioned where appropriate. The relationships between the groups or individuals are presented in Figure 1.

Z-301-01 STEELCOTE FACILITY

SHANNON & WILSON, INC.
Geotechnical Consultants



ORGANIZATIONAL CHART

FIGURE 1

Facility Owner

The owner and operator of the facility, Steelcote Manufacturing Company will be represented by Mr. Alphonse McMahon.

Shannon & Wilson, Inc.

Shannon & Wilson, Inc. has been selected by the client to conduct the activities described in the sampling plan. Mr. Lawrence Rosen is Shannon & Wilson's Site and Project Manager A Shannon & Wilson Vice President, Mr. D.J. McQueen will be available as a consultant on all matters concerning the project, including personnel assignments. Mr. Richard Frueh will serve as the Quality Assurance/Quality Control Manager and will report directly to Mr. McQueen.

Mr. Murray L. Meierhoff will serve as Shannon & Wilson's Health and Safety Officer and Mr. Lawrence Rosen will be responsible for matters pertaining to the health and safety of on-site personnel. Mr. Rosen will serve as Field Site Manager and Site Health and Safety Supervisor. He will have direct responsibility for site-specific activities as well as decisions concerning the immediate safety of on-site personnel.

1.3 Contents of Plan

This plan includes the following sections:

Sample Handling
Measurement Procedures
Sample and Location Designation
Sample Documentation
In-situ Testing
Cross Contamination Preventive Measures

1.4 Quality Assurance Objectives

The overall objective of this Quality Assurance Project Plan (QAPP) is to set quality criteria for project activities and documentation of quality to scientifically and legally support site activities and future tasks, including any cleanup activities. The remainder of this section establishes specific criteria for measurement objectives, method detection limits, and analytical quality control parameters for the project.

Measurement Objectives

Measurement parameters vary depending on the specific sampling event, the type and concentration of the analyses, and the sampled material. All measurements will be made to yield consistent results that are representative of the sampled material and analyte measured. All data will be reported in units consistent with those of previous investigations so that the data will be comparable.

Method Detection Limits

Provision of analytical data at concentrations necessary to conduct an assessment will require that Routine Analytical Service (RAS) analyses, as defined by the U.S. EPA Contract Lab Program (CLP), be employed.

Quality Control Parameters

To meet the quality assurance objective stated above, the following quality control parameters will be considered: precision and accuracy, completeness, representativeness, and comparability.

Precision and Accuracy

The precision and accuracy quality control parameters provide a measure of reproducibility of the analytical results and the bias of a specific measurement method. In all cases the precision and accuracy parameters shall be within the historical limits identified in the "U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis" (1988).

Completeness

Field completeness will be assessed by comparing the number of samples collected to the number of samples planned. Laboratory completeness will be assessed by comparing the number of valid samples to the number of samples collected. The overall completeness is a comparison between the total number of valid samples to the number of samples planned. The field completeness goal for this project is 100 percent. That is, all the samples planned will be collected and shipped to the laboratory. Samples will be selected for analysis based upon the materials presented in the sampling plan. The laboratory completeness goal for this project relative to which analyses/samples selected for analyses is 90 percent.

Representativeness

Representativeness defines the degree to which sample data accurately and precisely represent actual site conditions. Representativeness will be determined by:

- Comparing actual sampling procedures to those presented in the Sampling Plan.
- Comparing analytical results of field replicas to determine the spread in analytical results.
- Examining the results of quality control blanks for evidence of external or cross-contamination.
- Invalidating nonrepresentative data or identifying data to be classified as questionable or qualitative.

Only representative data will be used in subsequent data reduction, validation, and site characterization.

Comparability

Comparability is a qualitative parameter used to express the confidence with which one data set may be compared with another. Other data sets that may be used for comparison purposes are applicable hazard criteria and, where appropriate, data available from other studies conducted previously in the area. The analytical results obtained will be compared to the

analytical levels required to design cleanup. To produce comparable data, the units specified for analytical results obtained during the field investigations will be consistent with those specified for previous investigations, and analytical detection methods will be consistent for each analysis.

2.0 SAMPLE HANDLING

This section addresses the procedures for collecting samples, preparing samples for transport to the laboratories, and documentation. The sample media include water and soil.

2.1 Sample Custody

Sampling team personnel will perform all sampling and will retain sample custody until delivery by Shannon & Wilson's personnel to the laboratory. The Field Manager will be responsible for all on-site sample custody procedures. Sample custody includes sample collection, laboratory custody, and final evidence files.

New sample containers necessary for completing field sampling and Quality Control (QC) requirements will be provided to the field personnel by the laboratory. Each lot of sample containers is checked for cleanliness and integrity by the laboratory. Two random wipe checks will be performed by field personnel.

The custody of the physical samples collected during the field investigation will be the responsibility of the Field Manager. Each sample will be in the possession of the field sampling crew after collection until it is delivered to the laboratory. Samples shall be delivered to the laboratory by the field sampling crew at the end of each day and within twenty-four (24) hours of collection.

During the field studies, samples will be received at the laboratory by the sample custodian who examines each sample to verify that: (1) it is the expected sample; (2) the sample container is not damaged; (3) the documentation is completed and adequate; and (4) the sample has been preserved and stored properly. The sample custodian's signature on the Chain-of-Custody Record indicates that he has completed these tasks.

A sample or a final document file will be in Shannon & Wilson's custody if:

- It is in Shannon & Wilson's possession.
- It is in the view of a Shannon & Wilson employee, after being in Shannon & Wilson's possession.
- It was in Shannon & Wilson's possession and was placed in a secure area by a Shannon & Wilson employee.
- It is in a Shannon & Wilson designated secure area.
- It has been shipped to or delivered to the laboratory.

The final document files will include all originals of laboratory reports and will be maintained in a secure area. The Chain-of-Custody program will provide for the tracking of possession and handling of the samples from the time of field collection through laboratory analysis.

2.2 Soil

Physical Testing

Soil samples for physical testing will be collected from soil borings and from the cap materials overlaying completed cells. Because the tests are not analytical, cross contamination is not a consideration and decontamination between samples is not necessary. The specific procedures will include:

1. Identify and document in the site log book (maintained by the site manager), the names of the sampler(s), the sample and location designation, the sample collection point or points, and the sampling devices used.
2. Complete log book entries, sample tags (labels), field record sheets with sample and location designation, date, time, and name of the sampler(s).
3. Seal Shelby tube ends with wax.
4. Place tags (labels) on Shelby tubes.
5. Place the sample into the shipping container and complete the applicable portion of the Chain of Custody sheet.

6. At the end of each day, seal the shipping container, complete the Chain of Custody sheet, and transport to a secure area for delivery to the laboratory.

Analytical Testing

The procedures for documentation of soil samples to be subjected to analytical testing are as follows:

1. Identify and document in the site log book (maintained by the site manager) the names of the sampler(s), the sample and location designation, the sample collection point or points, and the sampling devices used.
2. Complete log book entries, sample tags (labels), field record sheets with sample and location designation, date, time, name of the sampler(s), and analyses.
3. Place tags (labels) on amber glass jars and place jars in plastic bags sealed with tape.
4. Place the sample into the shipping container (cooler packed with ice) and complete the applicable portion of the Chain of Custody sheet.
5. At the end of each day, seal the shipping container, complete the Chain of Custody sheet, and transport to the laboratory. Note that samples which require analytical testing must be transported to a laboratory within 24 hours of their collection and must be cooled with ice between the time of collection and their delivery to the laboratory.

2.3 Liquids (includes analytical testing for ground water and surface water samples only)

1. Utilizing the pH and conductivity meters, immediately obtain pH, conductivity, and temperature values from an aliquot of the liquid sample.
2. Identify and document in the site log book (maintained by the site manager) the names of the sampler(s), the sample and location designation, the sample collection point or points, and the sampling devices used.

3. Complete log book entries, field analytical values, sample tags (labels), field record sheets with sample and location designation, date, time, name of the sampler(s), and proposed analyses.
4. Place tags (labels) on amber glass jars and place jars in plastic bags sealed with tape.
5. Place the sample into the shipping container (cooler packed with ice) and complete the applicable portion of the Chain of Custody sheet.
6. At the end of each day, seal the shipping container, complete the Chain of Custody sheet, and transport to the laboratory. Note that samples which require analytical testing must be transported to a laboratory within 24 hours of their collection and must be cooled with ice between the time of collection and their delivery to the laboratory.

2.4 Duplicates, Background, and Blanks

Soil

Two background soil samples will be collected for chemical analyses from sites apparently upgradient and outside of the property. Duplicate samples (splits) will be prepared from soil borings by selecting (at random) one sample for duplicate analyses from every ten samples collected. This sample will be split into two samples and submitted for analyses. The sample splits will be labeled with a duplicate designation unknown to the analytical laboratory.

Liquid

Sample blanks will be collected and submitted for chemical analyses once during the initial stage of the field activity. Duplicate samples (splits) will be prepared from liquid samples by selecting (at random) one sample for duplicate analyses from every ten samples collected. This sample will be split into two samples and submitted for analyses. The sample splits will be labeled with a duplicate designation unknown to the analytical laboratory.

3.0 MEASUREMENT PROCEDURES

3.1 Station Designation

A grid station system will be established and will be determined on a north-south basis as per Figure 2.

3.2 Survey Station Locations

In cases where survey station locations are included as a part of the location designation (see Section 4.1), the initial designations will be made by tape measurement from a site feature with a known station location. Wells, sample points, and some soil borings may be surveyed into the station system after field work is complete and record keeping documents will be modified to reflect the enhanced locations.

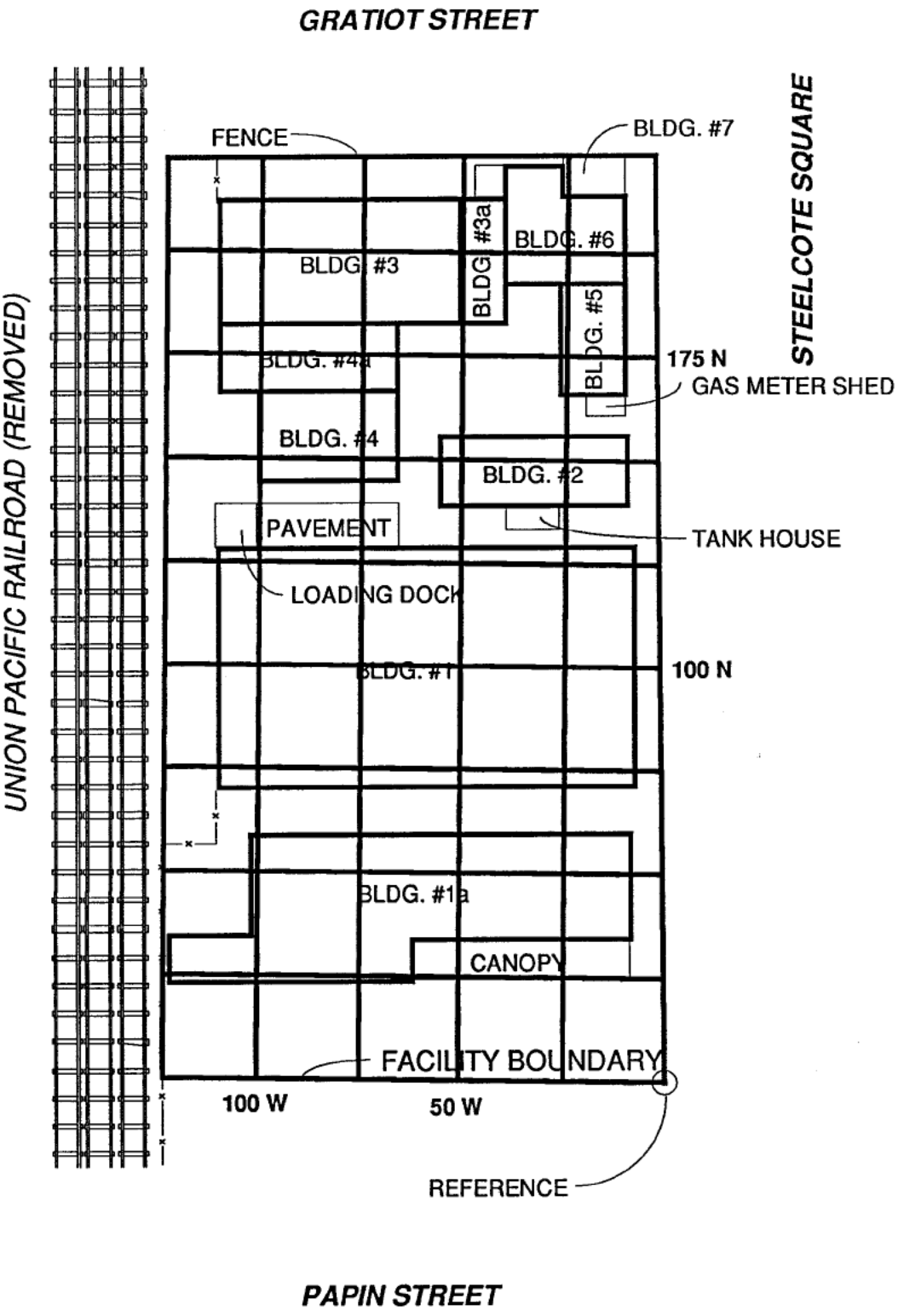
3.3 Well Development/Purging

In order to obtain accurate water level and sample analyses, ground water monitoring wells will be developed after installation and purged prior to sampling. Development will take place after the wells have stabilized (at least 48 hours after installation is complete) by either removing all or a minimum of five casing-volumes of water with an oil-free compressor or by bailer. During development, pH, temperature and specific conductance will be monitored and recorded on the well construction log. Development and purge water will be contained in 55-gallon drums until the results of analytical testing are available. At that time, disposal will be made as appropriate.

Prior to sampling, wells will be purged by removing with a bailer all (if a well bails dry), or at least five casing-volumes of water. This activity will not occur until at least five days after the well has been developed.

3.4 Well Water Levels

Levels in ground water and leachate monitoring wells will be measured to the top of the casing with an electric tape. Prior to measurement in any well, the tape will be cleaned as specified in Section 7.6.



SOURCE: STEELCOTE MANUFACTURING COMPANY, 1991

NORTH

0 20 40 80

SCALE, in feet

SAMPLE GRID

Z-301-01 STEELCOTE FACILITY

SHANNON & WILSON, INC.
Geotechnical Consultants

FIGURE 2

4.0 SAMPLE AND LOCATION DESIGNATIONS

4.1 Locations

Location designations tied into survey station locations will initially be approximate. Wells and, if appropriate, other locations will be accurately located by survey after field work has been completed and appropriate documents will be modified to reflect the enhanced accuracy of the survey.

Soil Borings

Soil borings will receive location designations as follows:

1. The first two letters followed by a / will be SW/ and will identify the boring as one made by Shannon & Wilson.
2. The / will be followed by a number to indicate the field work stage during which the boring was made. For example, SW/2 would indicate a soil boring made during the second stage field work.
3. The number will be followed by a letter in parentheses, such as (H) which will indicate the location of the boring. The corresponding soil log will include the soil boring location cross referenced by the designation and the surveyed station location.

Ground Water Monitoring Wells

Ground water monitoring wells will receive location designations as follows:

1. The first four letters followed by a / will be SWGW/ and will identify the well as one installed by Shannon & Wilson. Note that a ground water monitoring well designation can superceed a soil boring designation if the boring is converted to a well.

2. The / will be followed by a number to indicate the field work stage during which the boring was made. For example, SWGW/2 would indicate a well installed during the second stage field work.
3. The number will be followed by a letter in parentheses, such as (H) which will indicate the location of the well. The corresponding well construction log and soil boring log, if appropriate, will include the well location cross referenced by the designation and the surveyed station location.

Surface Flow Sample Points

Surface flow sample point locations will be indicated by SWSF followed by a / and the survey station designation. For example, SWSF/N700,E400 would indicate a sample location at survey station N700,E400.

4.2 Sample Designation

Soil Samples

Samples taken from soil borings for either analytical or physical testing will be designated as follows:

1. The complete soil boring designation will be followed by the letter D or C to indicate discrete or composite sample.
2. The letter D or C will be followed with the depth interval measured from the surface in parentheses. The number would be followed by either the letter P or A to designate whether the sample was to be subjected to physical or analytical sampling. For example SW/2(C)D(20.0-20.5)A would be a soil sample collected during a boring made by Shannon & Wilson, Inc. during the second stage of field work at location C. The sample would be a discrete sample taken from a interval between 20.0 and 20.5 feet from the surface which is to be analyzed for contaminants of concern.

Liquid Samples

Ground Water Wells

Water samples taken from ground water wells will include the ground water well location designation followed by the sample date in parentheses. For example, SWGW/1(D)(12/03/91) indicates a water sample obtained from a ground water monitoring well at location D which was installed during the initial stage of field work by Shannon & Wilson, Inc. on December 3, 1991.

Surface Water Samples

Surface water samples taken will include the sample point location designation followed by the date of sampling in parentheses. For example, SWST/N700,E400(07/11/92) would indicate an upgradient water sample taken from the stream at survey station N700,E400 on July 11, 1992.

5.0 SAMPLE DOCUMENTATION

Bound, site-specific field logbooks with prenumbered pages will be maintained to document the following daily field activities or information:

- Identification of sample
- Type of sample
- Location of sample
- Depth of sample
- Sample withdrawal procedure/equipment
- Date and time of collection
- Types of sample containers and sample identification numbers
- Parameters requested for analysis
- Sample shipment method
- Field observations on sampling event
- Name of collector(s)
- Weather conditions
- Sample description (color, odor, etc.)

The field logbooks will be the responsibility of the Field Manager during the field investigation. A QA/QC review of the field logbook will be performed during each performance audit.

Samples will be collected under Chain of Custody procedures. Standard forms including sample labels, sample tags, chain of custody forms, and custody seals used for sample tracking will be maintained. Examples of these forms are provided as Figures 3, 4, and 5. The format of some of these forms may be modified in order to be compatible with the analytical laboratory sample logging and chain of custody procedures.

A brief discussion of the application of these forms is as follows:

Z-301-01 STEELCOTE FACILITY

SHANNON & WILSON, INC.
Geotechnical Consultants

Shannon & Wilson, Inc.

400 N. 34th Street, Suite 100
Seattle, WA 98103
(206) 632-8020

11500 Olive Blvd., Suite 276
St. Louis, MO 63141
(314) 872-8170

2055 Hill Road
Fairbanks, AK 99707
(907) 479-0600

5430 Fairbanks Street, Suite 3
Anchorage, AK 99518
(907) 561-2120

Chain of Custody Record

Page _____ of _____
Laboratory _____
Attn: _____

Analysis Parameters/Sample Container Description
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp.	Grab							Total Number of Containers	Remarks/Matrix

Project Information		Sample Receipt	
Project Number:		Total Number of Containers	
Project Name:		COC Seals/Intact? Y/N/NA	
Contact:		Received Good Cond./Cold	
Ongoing Project? Yes ☐ No ☐		Delivery Method:	
Sampler:		(attach shipping bill, if any)	

Instructions
Requested Turn Around Time:
Special Instructions:

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Company:	Company:	Company:

Received By: 1.	Received By: 2.	Received By: 3.
Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Company:	Company:	Company:

Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory report
Yellow - w/shipment - for consignee files
Pink - Shannon & Wilson - Job File

F-19-91/UR

No. 11209

CHAIN OF CUSTODY RECORD

FIGURE 3

5.1 Chain of Custody Form and Seals

One Chain of Custody form (see Figure 3) is to be completed for each shipping container (cooler). All signoffs are to be complete, one completed copy is to be given to the laboratory, and the original is to be kept in S&W files. The Chain of Custody will contain the following information.

1. Sample numbers
2. Signature of collector
3. Date and time of collection
4. Sample type
5. Identification of sampling point
6. Number of containers
7. Signature of person(s) involved in the chain of possession
8. Inclusive dates and times of possession
9. Analyses requested

Each Chain-of-Custody Record will be filled out and signed in permanent ink by the Shannon & Wilson field team member prior to sealing the container. A photocopy will be made of the Chain-of-Custody Record before sealing it inside the container, to keep a current record of shipments to the laboratory. The container will then be delivered to the laboratory.

Two Chain of Custody Seals (see Figure 4) per shipping container are to be used to secure the lid and to provide evidence that the samples have not been disturbed. The seal numbers are to be recorded on the Chain of Custody Form and the seals are to be covered with clear tape.

5.2 Sample Tags (Labels)

Each sample container must have a Sample Tag or Label (see Figure 4) affixed to it and tag or label numbers must be recorded on the Chain of Custody Form.

Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, Missouri 63141
314/872-8170

JOB#_____ DATE_____
DESTINATION_____
_____
_____
NUMBER OF SAMPLES_____
CHAIN OF CUSTODY NUMBER_____
SIGNATURE_____

Shannon & Wilson, Inc.
11500 Olive Blvd., Suite 276
St. Louis, Missouri 63141
314/872-8170

JOB#_____ DATE_____ TIME_____
SAMPLE#_____ COLLECTOR_____
PRESERVATIVE_____
NUMBER OF SAMPLES_____
CHAIN OF CUSTODY NUMBER_____

SIGNATURE_____

SHIPPING CONTAINER SEAL AND SAMPLE LABEL

Z-301-01 STEELCOTE FACILITY

SHANNON & WILSON, INC.
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FIGURE 4

5.3 Other Labels

The shipping containers must have other labels as specified in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (USEPA, 1986 pages 50a and 50b) including the following information:

1. Environmental Laboratory Samples
2. This Side Up (2 labels)
3. Up Arrows (4 arrows, one on each side of the container)
4. Danger Label
5. Address Label
6. Number of Containers in Shipment

Paperwork accompanying the samples being delivered to the laboratory will be sealed in a plastic bag taped to the inside of the shipping container. Sign-off of Chain of Custody forms and submittal of the original to S&W will be done when the samples are logged into the laboratory chain of custody procedures. At a minimum, the laboratory records must include a means of recording crucial sample information including but not limited to:

1. Sample Designation
2. Sample Media (soil or water)
3. Chain of Custody Number
4. Laboratory Assigned Sample Designation
5. Date and Time Received
6. Sample Temperature

6.0 IN-SITU TESTING DESIGNATION/DOCUMENTATION

6.1 Soil Logs

An example of a soil log boring is presented in Figure 5. Information to be included on the log is as follows:

1. Personnel including the logger, driller, and any other participants; and, information on drilling and soil sampling equipment.
2. Location designation including survey station number and elevations. Note that the original station and elevation numbers are approximate and will, if appropriate, be upgraded after a survey is conducted.
3. Time and environmental conditions including date, time of day, and working conditions such as weather, access, soil moisture, etc.
4. Cross reference to well if a well was installed in the borehole.
5. Sample data including sampler type (continuous, split spoon, Shelby tube, etc), sample purpose (analytical or physical testing), sample type (discrete or composite), depth interval (measured from the surface), driving resistance, and ground water contacts.
6. Field classification including visual classification and readings from the photo-ionization detector.
7. Field log of boring including visual classification of cuttings and hole readings obtained from field instruments including the photoionization detector and the combustion meter.
8. Ground water data including water contacts, water measurements over time and, in cases where wells are installed, the rationale for installation and construction (screen size and placement).

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FIELD LOG OF BORING

JOB NO.

LOGGED BY _____ JOB _____

DRILL CONTRACTOR _____ BORING NO. _____ ELEV. _____

DRILLER _____ TYPE DRILL _____ LOCATION _____

SIZE & TYPE OF CASING _____ DATE _____ WEATHER _____

SAMPLE DATA							FIELD CLASSIFICATION
SAMPLE NO. / TYPE	DEPTH FROM / TO		DRIVING RESISTANCE BLOWS/6 IN.	LENGTH NO. SAVED	DRILL ACTION	CONTACTS/ GROUNDWATER	

DEPTH FROM	DEPTH TO	FIELD LOG OF BORING

REMARKS

HAMMER WT. _____ STROKE _____

HAMMER LIFT _____ SAMPLER _____

ROD DIA. _____ NO. OF TURNS _____

WATER LEVEL	TIME	DATE

FOOTAGE DRILLED _____

NO. SAMPLES: ATTEMPTED _____ RECOVERED _____

TIME DISTRIBUTION THIS HOLE

ON HOLE _____ DONE DRILLING _____

DRILLING _____ OFF HOLE _____

BORING NO. _____ SHEET ___ OF ___

F-2-85

SOIL BORING LOG

Z-301-01 STEELCOTE FACILITY

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FIGURE 5

6.2 Well Construction Logs

Ground water monitoring well construction will be recorded on construction logs and presented in Figures 6 and 7. Information will include:

1. Identification including the site name, the permit number if applicable, the well, and soil boring designation (soil boring log will be attached).
2. Location information including horizontal location (+/- 0.5 ft) tied into the site survey stations and elevation (+/- 0.01 Ft MSL).
3. Soil boring information transferred from the Soil Boring Log.
4. Well material specifications.
5. Ground water level measurements and cross references to Aquifer Test Logs.

6.3 Field Instruments

Photo-ionization and/or Flame Ionization Detector

The photo or flame-ionization detector will be serviced by a qualified manufacturer's representative prior to field work as per manufacturer's specifications. A copy of the work order and invoice including the instrument serial number will be attached to the field log. The instrument will be calibrated on each day of field work prior to the commencement of field work. The calibration will be as per manufacturer's specifications. The individual making the calibration will make and initial a daily entry into the field log.

Combustion Meter

The combustion meter will be serviced by a qualified manufacturer's representative prior to field work as per manufacturer's specifications. A copy of the work order and invoice including the instrument serial number will be attached to the field log. The instrument will be calibrated each day of field work prior to the commencement of field work. The calibration will be as per manufacturer's specifications. The individual making the calibration will make and initial a daily entry into the field log.

MONITORING WELL / PIEZOMETER CONSTRUCTION
DOCUMENTATION FORM

Site name _____ Permit # _____
Well or Piezometer # _____ Date started _____ Date completed _____

A. Surveyed Locations and Elevations

Locations (± 0.5 ft.):
- Specify corner of site _____
- Distance and direction along boundary _____
- Distance and direction from boundary to well _____

Elevation (± 0.01 ft. MSL):
- Ground surface _____
- Top of protective casing _____
- Top of well casing _____
- Benchmark elevation _____
- Benchmark description _____

B. Soil Boring Information

Name and address of construction company

Name of driller _____
Drilling method _____
Drilling fluid _____
Bore hole diameter _____
Soil sampling method _____
Depth of boring _____

C. Monitoring Well Installation

Casing material _____
Length of casing _____
Outside casing diameter _____
Inside casing diameter _____
Casing joint type _____
Casing/screen joint type _____
Screen material _____
Screen opening size _____
Screen length _____
Depth of well _____

Well Installation, continued:

Filter pack:
- Material _____
- Grain size _____
- Volume _____

Seal (minimum 3 ft. length above filter pack):
- Material _____
- Placement method _____
- Volume _____

Backfill (if different from seal):
- Material _____
- Placement method _____
- Volume _____

Surface seal design:
- Material of protective casing: _____
- Material of grout between protective casing and well casing: _____
- Protective cap:
  - Material _____
  - Vented? Y/N __ Locking? Y/N _____
- Well cap:
  - Material _____
  - Vented? Y/N _

D. Ground Water Measurement

Water level (± 0.01 ft. below top of inner well casing) _____
Stabilization time _____
Well development method _____

Upgradient or downgradient well?

Average depth of frostline _____

MONITORING WELL DOCUMENTATION FORM

Z-301-01 STEELCOTE FACILITY

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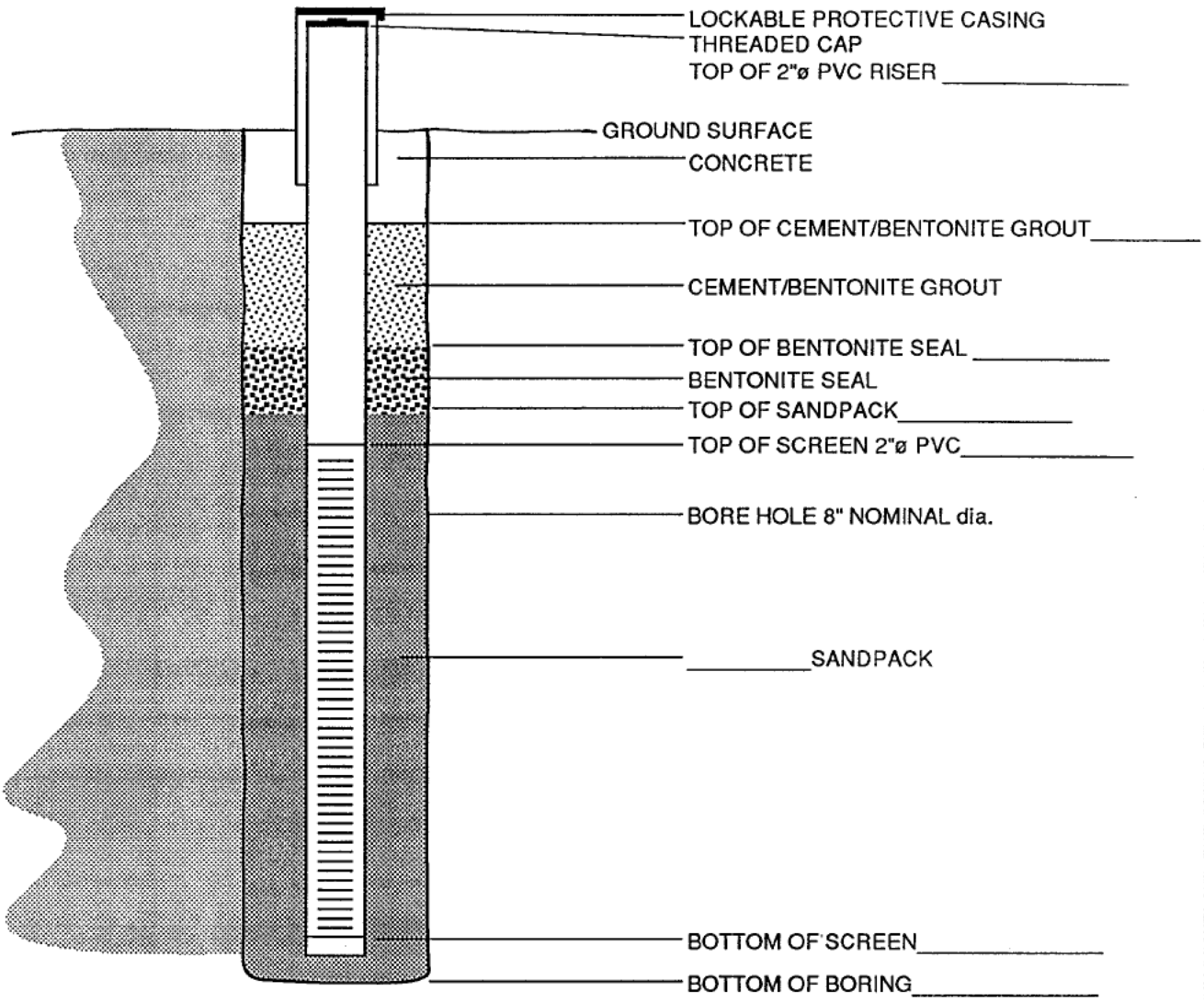
FIGURE 6



WELL COMPONENTS

SCREEN _____

RISER PIPE _____

GROUT _____

BENTONITE SEAL _____

SANDPACK _____

PROTECTIVE CASING _____

WELL CONSTRUCTION LOG

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FIGURE 7

Conductivity Meter

The conductivity-temperature meter will be calibrated against a known standard prior to each sampling event or series as per manufacturer's specifications.

pH Meter

Prior to each use, the pH meter will be standardized against both the 7.00 buffer solution, and either of the 4.00/10.00 buffer solutions. The standardization procedure should be continued until readings are within 0.05 units of the buffer solution values. All buffers and rinses should be uniform temperature.

6.4 Hydrologic Tests/Measurements

Test Instruments

The drilling contractor will be required to submit a certification of calibration for all gages prior to conducting aquifer tests. Copies of these certificates will be attached to the test records and the Field Log book.

Aquifer Tests (Unconsolidated Pump and Rock Pressure)

Aquifer pump tests will be recorded on the form presented in Figure 8. Information will include the well designation (Observation Point) and the elevation of the measuring point. Information to be recorded will include time and water level parameters. In addition, a copy of the tape from the data logger will be attached to the form.

Ground Water Well Levels

Well development records will be recorded on Figure 9. Initial measurements and any subsequent measurements will be entered on the Well Construction Logs and the associated Soil Boring Logs. Measurements will also be recorded in the field log book.

Surface Flows

Flow estimates will be recorded in the field log book. This information will include a drawing of the cross-section profile showing the stream routing, bed and the water level where applicable at the time of sampling, the gradient measured from points 50 feet above and 50 feet below the monitoring point, a visual estimate of roughness, an observation of weather conditions, and flow (sheet, turbulent or laminar).

Z-301-01 **STEELCOTE FACILITY**

DATE	WELL NUMBER	STATIC WATER LEVEL (FT. TO TOP OF CASING)	TOC TO TOP OF SCREEN (FT.)	HERMIT TOST NUMBER	STATIC TRANSDUCER HEAD VAKIE	HERMIT REFERENCE LEVEL (FT.)	DESIRED DRAWDOWN (FT.)	PRESSURE REQUIRED FOR DRAWDOWN (PSI)	COMMMENTS	COMPUTER DATA FILE DESIGNATION

AQUIFER TEST LOG

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FIGURE 8

JOB NAME _____ JOB NO. _____

BY _____ DATE _____ SHEET ____ OF _____

WELL DEVELOPMENT DATA

1. Well No. _____
2. Date of Installation _____
3. Date of Development _____
4. Static Water Level: Before Dev. _____ Ft.; 24 Hours After _____ Ft.
5. Quantity of Water Loss During Drilling, If Used _____ Gal.
6. Quantity of Standing Water in Well and Annulus Before Dev. _____ Gal.

	Start	During		End
7. Specific Conductance (μmhos/c)	_____	_____	_____	_____
Temperature (c)	_____	_____	_____	_____
pH (s.u.)	_____	_____	_____	_____

8. Depth from Top of Well Casing to Bottom of Well _____ Ft.
9. Screen Length _____ Ft.
10. Depth to Top of Sediment: Before Dev. _____ Ft.; After Dev. _____ Ft.
11. Physical Character of Water: _____
12. Type and Size of Well Development Equipment: _____
13. Description of Surge Technique, If Used: _____
14. Height of Well Casing Above Ground Surface: _____ Ft.
15. Quantity of Water Removed: _____ Ga.
16. 1-Pint Water Sample Collected: _____ (Time)

    * Development Conditions:

    (1) Well Water is Reasonably Clear

    (2) Sediment Thickness <5% of Screen Length

    (3) Removal of 5 Well Volumes, Including Saturated Filter Annulus

    (4) Stabilization of Specific Conductance and Water Temperature

17. After Final Development of the well, water from each well will be placed into the 1 liter clear glass container and photographed as a 35 mm. color slide to be submitted as part of the well log.
18. QA/QC: Development Performed by: _____

    Site Manager: _____

WELL DEVELOPMENT LOG

Z-301-01 STEELCOTE FACILITY

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FIGURE 9

7.0 CROSS CONTAMINATION PREVENTIVE MEASURES

The prevention of cross contamination is necessary to insure accurate analytical results. Decontamination procedures for equipment and materials which may come into contact with samples collected for analytical testing are as follows:

7.1 Personnel

Personnel decontamination and personnel protective equipment is addressed in the Hazard Assessment and Safety Plan. However, personnel protective equipment involves wearing gloves which affect sample cross contamination preventive measures. Latex gloves (surgical) will be used during the handling of all samples and a fresh pair of gloves will be donned immediately prior to each sampling event.

7.2 Drilling Equipment

All drilling equipment including augers, sample tools, center rods, pilot assemblies, etc. and the rear end of the drill and carrier will be decontaminated by the use of a steam cleaner prior to any drilling activity. No drill or equipment will be allowed to make borings if visual contamination is present on the equipment.

Prior to the making any soil boring, all equipment to be advanced into the hole will be cleaned as follows:

1. All visible residue is to be removed with brushes and a tri-sodium phosphate solution.
2. After visible residue has been removed, the equipment will be sprayed with a steam cleaner, rinsed with methanol and, again, sprayed with a steam cleaner.
3. Two random wipe tests will be employed to check the effectiveness of the cleaning operation.

7.3 Sampling Equipment

In addition to decontamination described in the preceding section, split spoons, Shelby tubes, and continuous samplers will be decontaminated between each sample by brushing with a tri-sodium phosphate solution followed by a potable water rinse, methanol rinse, and a potable water rinse. Two random wipe tests will be employed to check the effectiveness of the cleaning operation.

7.4 Sample Containers

All sample containers will be obtained from the analytical laboratory subcontractor. The laboratory will provide and certify clean, amber glass containers with either teflon or foil-lined caps. Two random wipe tests will be employed during field operations to verify that clean sample containers are being received.

7.5 Well Installation Supplies

Well casing, screens, and centers will be cleaned at the site and prior to installation by steam cleaning followed by a methanol rinse and steam cleaning. Two random wipe tests will be employed during field operations to verify that clean materials are being installed.

7.6 Water Sampling and Measuring Equipment

Electric water tapes and other equipment which comes into contact with water will be decontaminated between each sample by brushing with a tri-sodium phosphate solution followed by a potable water rinse, methanol rinse, and a potable water rinse. Two random wipe tests will be employed to check the effectiveness of the cleaning operation.

Since each well will have a dedicated bailer, the bailers will be decontaminated only prior to installation.

8.0 ANALYTICAL PROCEDURES

Laboratory analysis of soil and water solids will be performed by a yet to be selected laboratory. The analytical procedures of the selected laboratory will be based upon the quality assurance guidelines provided in the following:

- Handbook for Analytical Quality Control in Water and Wastewater Laboratories, (EPA-600/4-79-019).
- Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition.
- 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" (Federal Register, October 26, 1984 and revisions).

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 Data Reduction

All field data will be entered into bound notebooks. Field logbooks, Chain-of-Custody Records, field data sheets, work sheets including computer printouts, and lab reports will be filed and stored as part of the final document file at Shannon & Wilson's offices, St. Louis, Missouri.

9.2 Data Validation

The precision of the laboratory data will be checked by comparison of the analytical results with the QC samples. The validity of the soil, sediment, and solids data will also be assessed by comparison of blanks, replicates, and on-site samples.

9.3 Reporting

The laboratory will provide only a summary of analyses results. They will maintain the raw analyses and calculation data on their premises.

Data collected during the field investigation and from the laboratory analyses results will be included as an appendix in the report prepared by Shannon & Wilson.

10.0 INTERNAL QUALITY CONTROL

To monitor sampling and laboratory performance and potential transport anomalies, QC samples including blanks, and replicate samples will be submitted with the samples collected in the field. The combined laboratory and field QC procedures will provide an adequate data base for evaluation of analytical data.

10.1 Replicates

A replicate sample is collected when one soil sample is split into two portions producing two samples. Soil replicate samples will be collected by splitting the soil sample into two equal portions with the soil knife and placing the portions in different sample bottles. This will determine laboratory analytical consistency and/or spatial variation of the soil material.

Replicates of soil samples will be obtained from samples with the highest suspected contamination as a check on sampling reproducibility. Ten percent of the soil samples analyzed will be selected for replicate analysis.

10.2 Duplicates

A duplicate sample is collected when one liquid sample is divided into two samples. Duplicates of ten percent of the liquid samples will be analyzed to check on sample reproducibility.

11.0 PERFORMANCE AND SYSTEMS AUDITS

Mr. Richard Frueh will be responsible for audits of the field team. Two performance audits will be conducted during the investigation. The initial audit will be performed to document that proper procedures are being followed and that subsequent data will be valid. A follow-up audit will be performed near the end of the investigation to show consistency.

The audits will focus on the details of the QA program. The audits will evaluate:

- Project Responsibilities
- Sample Custody Procedures
- Document Control
- Sample Identification System
- QC Corrective Action Procedures

12.0 DATA ASSESSMENT PROCEDURES

The selected laboratory will provide a QA/QC plan with detailed descriptions of specific routine procedures used to assess data precision, accuracy, and completeness.

13.0 CORRECTIVE ACTION

Corrective actions for laboratory analyses will be handled either internally by the selected laboratory or by consultation between the Laboratory QA/QC Officer and Mr. Frueh. The laboratory's internal corrective action procedures will be detailed in their Quality Assurance Program Plan. Based on his review of the laboratory results and QA data submitted, Mr. Frueh will identify which results, if any, which do not meet the QA objectives. Mr. Frueh then will make immediate decisions with the Laboratory QA/QC Officer on corrective actions to be taken, including new protocols to be followed. Mr. Frueh and the Laboratory QA/QC officer will develop the revised protocols in checklist format. A copy of all revised protocol checklists will be stored in the project files and reported in the final report.

Corrective action on a day-to-day basis for field sampling will be handled by consultation between the team members and the Field Manager. The Field Manager will make immediate decisions with the team members on new protocols to be followed. If appropriate, the Field Manager will develop in consultation with Mr. Frueh the revised protocol in checklist format. A copy of all revised protocol checklists will be stored in the project files. In addition, all changes in field sampling procedures will be documented in the field logbooks and reported in the final report.

14.0 QUALITY ASSURANCE REPORTS

A QA/QC audit report will be issued by Shannon & Wilson as part of the Project Report. The QA/QC report will include the results of the performance and document audits and any necessary corrective action procedures. In addition, a data quality assessment will be incorporated into the final report. Upon completion, the QA report will be reviewed by the QA/QC Manager.

HAZARDOUS ASSESSMENT AND SAFETY PLAN (HASP)

SHANNON & WILSON, INC.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141-7126
(314) 872-8170

HAZARD
ASSESSMENT
&
SAFETY PLAN

Site Name	STEELCOTE FACILITY
Project/Proposal #	Z-301
Date Prepared	March 20, 1992
Prepared By	Lawrence C. Rosen

SHANNON & WILSON, INC.
11500 Olive Boulevard, Suite 276
St. Louis, Missouri 63141
(314) 872-8170

SHANNON & WILSON, INC.
11500 Olive Blvd., Suite 276
St. Louis, MO 63141-7126
(314) 872-8170

A. BACKGROUND

1. Site Name: STEELCOTE FACILITY
2. Location: #1 STEELCOTE SQUARE, ST. LOUIS, MISSOURI
3. Client Contact: AL MCMAHON Phone: 314/444-6445
   Facility Contact: JIM MOORE Phone: 314/771-8053
4. Site Safety Officer: L.C.ROSEN
5. Client I.D.: _____
6. Site Team:

Name	Function
L.C. ROSEN	SITE MANAGER SAFETY MANAGER
M.L. MEIERHOFF	REGIONAL OFFICE SAFETY COORDINATOR

7. Plan Prepared by: Laurence C. Rosen (3/20/92)
8. Plan Approved by:
   * Project Coordinator Laurence C. Rosen (3/20/92)
   * Health & Safety Director _____ (3/20/92)

B. PRELIMINARY SITE CHARACTERIZATION

1. Facility Description: Manufacturing facility for industrial coatings. Note that operation is active.

2. Storage/Disposal Method:

Method	Number	Waste Quantity (units)
___ Surface Impoundment		
___ Pile		
_x_ Drum	unknown	55 gallon and smaller
_x_ Tank (above ground)	12	500 - 10,000 gallon
_x_ Tank (below ground)	2	500 & 1000 gallon
___ Landfill		
___ Landfarm		
___ Open dump		
_x_ Spillage	Potential soil contaminations as a result of overfills, accidental releases, etc.	
___ Other		

3.

Containment:	Explain
Adequate	Product storage in tanks and drums
Moderate	Integrity and contents of some drums and tanks are not known
Inadequate/poor	Potentially contaminated soil
Insecure/dangerous	

4. Site Status:

__X__ Active _____ Inactive _____ Unknown

5. Sampling Accessibility:

Sample locations easily accessible? _____ Yes __X__ No

Explain: Structures may interfere

6. Exposure Potential:

_____ High _____ Moderate __X__ Low

Explain: Materials are either contained or in dilute form (contaminated soil)

7. Waste Categories:

Solid _X_ Liquid _X_ Gas ___ Sludge ____

Other _____

8. Sensitive Areas: None known

9. Prevailing Wind: From _SW__ To _NE__

10. Alleged Contamination:

_X_ Ground Water

_X_ Surface Water

___ Air

_X_ Soil

___ Drinking Water

_X_ Sewers and Storm Drains

___ Other _____

11. Characterization of Material to be Sampled:

_X_ Toxic _?_ Soluble ___ Volatile

___ Corrosive ___ Infectious ___ Explosive

___ Radioactive _?_ Flammable _?_ Reactive

_X_ Persistent

12. Potential Hazardous Conditions:

___ Fire/explosive conditions

_X_ Worker exposure/injury

_X_ Unstable material containment

_X_ Damage to off-site property

___ Other _____

13. Site Features and Physical Hazards: (See Section E, Site Map)

The area, which is almost entirely covered by buildings or pavement, is an active operation conducted in a relatively small area (approximately 1/2 acre). As a result, physical hazards in the form of operations and street traffic are present. In addition, overhead electrical wires are present and containerized raw materials and product which may be flammable.

C. HAZARD ASSESSMENT - LISTED SUBSTANCES

Substance	Medium[1]	Maximum Conc.[2]	LEL[3]	PEL/TLV[4]	IDLH[5]	Cancer [6]
Xylene	Soil		1.0%	100**	1000**	
Ethyl Acetate	Soil		2.2%	400**	10,000**	
1-Butanol	Soil		1.4%	50**	8000	
Methyl Ethyl Ketone	Soil		N/A	200**	3000**	
Barium Compounds	Soil		N/A	0.5***	N/A	
Toluene	Soil		1.3%	100**	2000**	
Methyl Isobutyl Ketone	Soil		N/A	50**	3000**	
Butyl Benzyl Phthalate	Soil					
Lead	Soil		N/A	0.05***	N/A	
Dibutyl Phthalate	Soil		N/A	5***	9300***	
Lead Chromate	Soil		N/A	0.1***	30***	HP
Zinc Chromate	Soil		N/A	0.1***	30***	HP
Chromium	Soil		N/A	0.1***	500***	
2-Ethoxyethanol	Soil		2.5%	5**	6000**	
Cyclohexanone	Soil		1.1%	25**	5000**	HS
Nickel Compounds	Soil		N/A	1***	N/A	AP
Methanol	Soil		7.3%	200**	25,000**	
Carbon Tetrachloride	Soil		N/A	5**	300**	AP,HS
Di(2-Ethylhexyl) Phthalate	Soil		N/A	5***		HS
Phenol	Soil		1.7%	5**	250**	
2-Methyl-1-propanol	Soil		1.2%	100**	8000**	
Formaldehyde	Soil		7.0%	1**	100**	HS
Toluene 2,4-Diisocyanate	Soil		0.9%	0.005**	10**	

Substance	Medium[1]	Maximum Conc.[2]	LEL[3]	PEL/TLV[4]	IDLH[5]	Cancer [6]
Cadmium	Soil		N/A	0.05***	N/A	HS
Benzene	Soil		1.3%	10**	N/A	HP
Methylene Chloride	Soil		15.5%	50**	5000**	HS
Nitrosoimino Diethanol	Soil					HS
Epichlorohydrin	Soil		N/A	2**	100**	HS
Cumene	Soil		0.9%	50**	8000**	
Naphthalene	Soil		0.9%	10**	500**	HS

The primary mode of entry for chemicals is inhalation due to volatilization and/or airborne transport in particulate form of chemicals; however, ingestion (especially that due to hand-to-mouth contact) and direct contact (skin and soft tissue absorption) are also potential routes.

(1) Environmental Medium: Air (A), Surface Water (SW), Ground Water (GW), Soil (S), Sludge (SL), Drinking Water (DW).

(2) List the maximum detected concentration for each contaminant and medium separately.

(3) Lower Explosive Limit as a percentage. All drilling and excavations will be monitored with a combustible meter. If combustible gas in excess of 25 percent is encountered, the operation will be evacuated until atmospheric dispersion to conditions less than 25 percent occurs.

(4) Use the lower of the two exposure units ((PEL=Permissible Exposure Limits) (TLV=Threshold Limiting Value)). Because the lowest PEL/TLV is 0.005 ppm, the action level for Level C including preparation will be any reading on the OVA exceeding background levels. Protective clothing to avoid skin contact will be worn at all times.

(5) Concentration in atmosphere that are considered Immediately Dangerous to Life and Health.

(6) Cancer Status: Human Positive (HP), Human Suspected (HS), Animal Positive (AP), Animal Suspected (AS), Other (O).

* Parts Per Billion or mg/l
** Parts Per Million
*** Mg/M^3
**** Million Particles per cubic foot (Mppcf)

D. SITE ACTIVITIES

1. Proposed Date(s) of Activities: Spring and Summer, 1992

2. Proposed Scope of Work: The proposed scope of work includes those activities presented in the attached Work Plan. Specific on site activities which could result in exposure include:

   Drilling Soil Sampling Well Installation

   Surface and Ground Water Sampling Surveying

   Hydrologic Testing

3. Safety Specific Requirements:

   Personal Protective Equipment as Specified in Sections I & J.

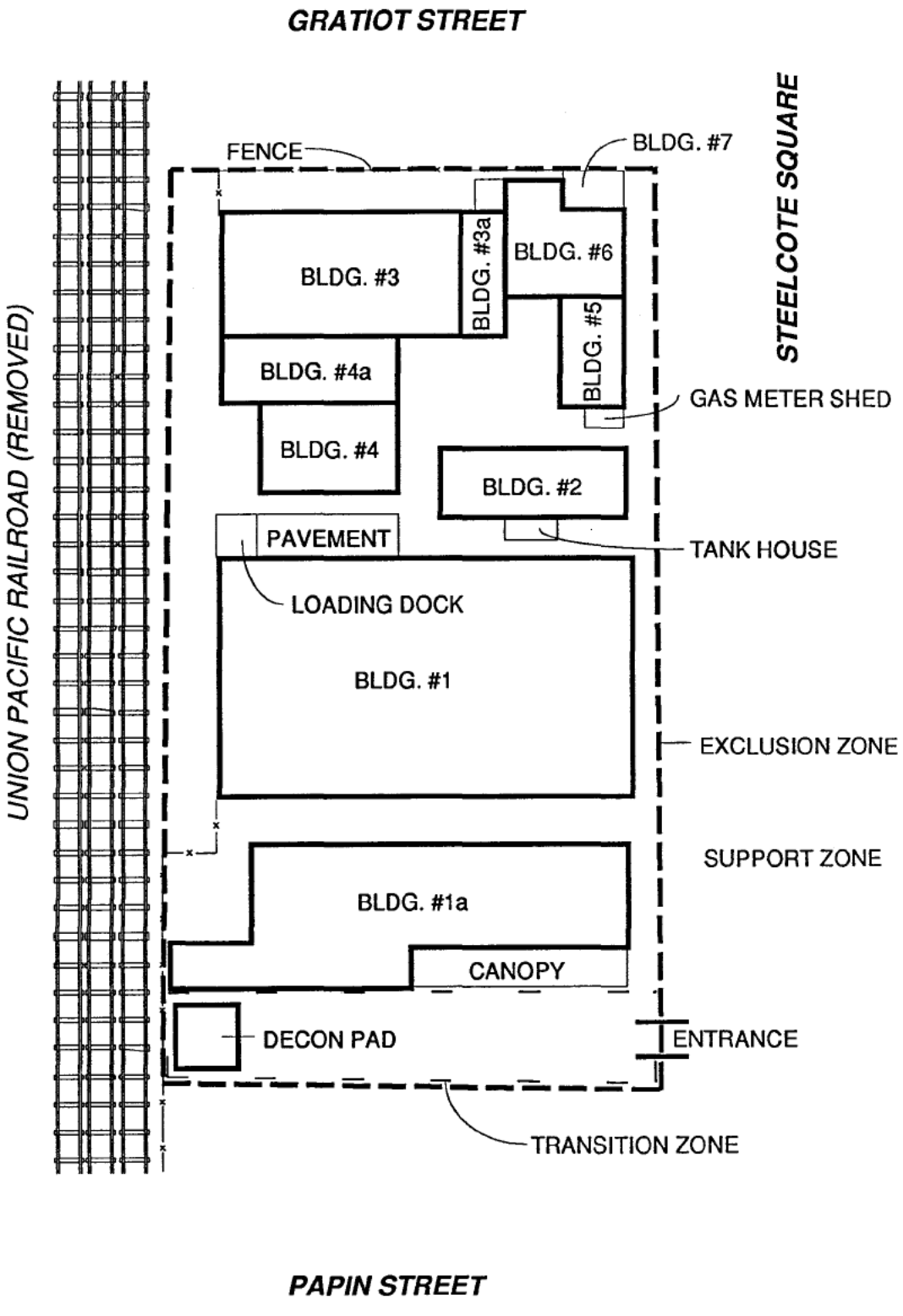
   Monitoring Procedures as Specified in Section H.

   Work Procedures as Specified in Section I.

   Personal Decontamination Procedures as Specified in Section K.

   Emergency Procedures as Specified in Sections L & M.

E. SITE MAP



SOURCE: STEELCOTE MANUFACTURING COMPANY, 1991

NORTH

0 20 40 80

SCALE, in feet

STEELCOTE FACILITY

Z-301-01

SHANNON & WILSON, INC.
Geotechnical Consultants

E. SITE MAP

F. MEDICAL REQUIREMENTS

All Shannon & Wilson and subcontracting personnel whose presence is required on a hazardous waste site must first be examined by a physician pursuant to OSHA Standards 29 CFR 1910.120 and 1910.134. The physician's clearance of each individual for work at the site or other evidence of clearance shall be documented and reviewed by the Corporate Health and Safety Director before the individual is permitted to enter the site. Shannon & Wilson personnel, whose presence may be required at a hazardous waste site where potential exposure to toxic or hazardous materials exists, shall participate in the Shannon & Wilson medical monitoring program as specified in the Shannon & Wilson Corporate Health and Safety Program. All medical examinations performed for Shannon & Wilson personnel and subcontracting personnel shall be conducted in accordance with OSHA Standards 29 CFR 1910.120 and 1910.134.

The requirements for a standard medical examination are defined in the Shannon & Wilson Corporate Health and Safety Program. However, it may be necessary to require specific clinical tests for certain hazardous waste sites. These tests will be determined by the Corporate Health and Safety Director in consultation with the company physician and Site Safety Officer. Any site-specific testing shall be identified below:

1. Site-Specific Clinical Tests: N/A

Parameter	Required Testing	Action Level

2. Medical Data Summary:*

This form shall be completed by all personnel prior to commencement of activities at a hazardous waste site. It shall be kept at the site for the duration of site activities. This form must be delivered to the attending physician when medical assistance is required.

Site:

Location:

Name:

Address:

Home Phone:

Height: _____ Weight: ____ Age: _____ Sex: ___

In case of emergency contact:

Address:

Phone:

Allergies:

Recent illnesses:

Previous exposure to hazardous substances?

_____ Yes _____ No

Current medication:

Medical restrictions:

Name of personal physician:

Address:

Phone:

*To be completed for each individual worker prior to site entry.

G. TRAINING REQUIREMENTS

All Shannon & Wilson and subcontracting personnel must complete at least 40 hours of health and safety training for hazardous waste operations as required by OSHA Standard 29 CFR 1910.120. The training must be updated on an annual basis (eight hours). The dates of certification for all on-site personnel must be recorded below.

1. Certification of Health and Safety Training:*

Name	Date of Initial Certification	Date of Last Refresher Course

2. Confined Space Entry:

   As a general rule, confined space entry is prohibited. However, if it becomes absolutely necessary to work within a confined space, the Corporate Health and Safety Director and Project Coordinator will establish specific procedures to be followed on a task-by-task basis.

3. All Shannon & Wilson personnel and third party personnel on-site must receive a copy of this Hazard Assessment and Safety Plan, have time to read and understand the requirements of this plan prior to entry on-site, and be instructed on the specific hazards associated with the work they are to perform on-site and with nearby operations.

   Safety briefings will be given daily by the Site Safety Officer to all personnel or as needed when new operations or safety procedures are implemented. These briefings will cover new procedures, questions personnel may have, and deficiencies noted in safety audits.

*To be completed for each individual worker prior to site entry.

H. ENVIRONMENTAL MONITORING

Calibration and maintenance of monitoring equipment shall be performed in accordance with Shannon & Wilson Standard Operating Procedures.

1. Monitoring Equipment Checklist:

Type of Equipment	Serial No.	SOP
Organic Vapor Analyzer (PID or FID)	*	as per manufacturer's specifications
Combustion meter	*	as per manufacturer's specifications

*To be completed for the specific instrument used on the site prior to its use

2. Surveillance Methods:

Organic Vapor Analyser — Probe will be periodically placed in holes during drilling, well installation, hydrologic testing and ground water sampling operations; and, in low areas such as manholes, natural or manmade depressions, and basements when ever operations occur in those specific areas. Level C Personal Protective Equipment will be required whenever sustained readings exceeding background are detected.

Combustion meter — Probe will be periodically placed in holes during drilling, well installation, hydrologic testing and ground water sampling operations; and, in low areas such as manholes, natural or manmade depressions, and basements when ever operations occur in those specific areas. Area evacuation will be required whenever sustained readings more than 25% LEL are detected.

I. SITE SAFETY PROCEDURES

1. Perimeter Establishment: The area of concern including the Exclusion and Transition Zones are blocked by either fencing or building walls.

2. Site Entry Procedures: All S&W personnel and subcontractors will log in and out of the site with the S&W Site Manager.

3. PPE Requirements: All field operations will be conducted in Level D PPE. If monitoring indicates that volatiles are present in the breathing zone above background levels, Level C PPE will be required.

4. PPE Modifications: As per Item 3.

5. PPE Selection Criteria:
   Direct contact potential for organics and metals
   Potential inhalation/ingestion of organics
   Note--Airborne particulates with metals is not considered a potential problem due to the limited extent of soil exposed at the site.

J. PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Level A protection should be selected when the highest level of respiratory, skin, eye, and mucous membrane protection is needed.

   * Positive-pressure, self-contained, breathing apparatus (MSHA/NIOSH approved) (REQUIRED)
   * Fully encapsulated, chemical resistant suit (REQUIRED)
   * Chemical-resistant inner and outer gloves (REQUIRED)
   * Chemical-resistant boots with steel toe and shank (REQUIRED)
   * Chemical-resistant coveralls
   * Two-way radio communication (REQUIRED)

2. Level B protection should be selected when the highest level of respiratory protection is needed, but with a lesser degree of skin and eye protection.

   * Positive-pressure, self-contained, breathing apparatus (MSHA/NIOSH approved) (REQUIRED)
   * Chemical-resistant clothing (coveralls, hooded two-piece, chemical-resistant splash suit; or disposable chemical-resistant coveralls) (REQUIRED)
   * Coveralls (under splash suit)
   * Chemical-resistant inner and outer gloves (REQUIRED)
   * Chemical-resistant boots with steel toe and shank (REQUIRED)
   * Two-way radio communication
   * Hard hat (REQUIRED)

3. Level C protection should be selected when the type and concentration of hazardous airborne substance is known, the criteria for using air-purifying respirators is met, and skin and eye exposure is unlikely.

   * Full face, air-purifying respirator (MSHA/NIOSH approved) with appropriate cartridges (REQUIRED)
   * Chemical-resistant clothing (coveralls, hooded two-piece chemical-resistant splash suit; or disposable, chemical-resistant coveralls (REQUIRED)
   * Chemical-resistant inner and outer gloves (REQUIRED)
   * Chemical-resistant boots with steel toe and shank (REQUIRED)
   * Two-way radio communication
   * Hard hat (REQUIRED)
   * Escape respirator

4. Level D is primarily a work uniform. It shall not be worn on site where respiratory or skin hazards exist.

   * Protective coveralls and protective gloves
   * Boots and steel toe and shank (REQUIRED)
   * Hard hat (REQUIRED)
   * Safety glasses

K. DECONTAMINATION

1. Personnel Decontamination Procedures: All personnel and equipment coming in contact with contaminated materials or areas will be required to go through the following decontamination procedures as appropriate:

   - Prior to entering the transition, remove gross contamination from protective garments and footwear;
   - Remove and dispose of outer layer boots;
   - Remove and dispose of suits;
   - Remove respirator and either prepare for rescue or undergo daily decontamination procedures;
   - Remove and dispose of surgical gloves; and
   - Wash hands in hand wash and face in face wash.

   All site personnel will perform the above mentioned decontamination procedure prior to leaving the site. Additionally, all personnel upon reaching their residence must shower.

   Breaks can be taken within the exclusion or transition zone without decontamination. Drinking of water and/or gatorade will be allowed in the transition zone after partial decontamination which will include removal of respirator, gloves, and hat and face and hand wash. Decontamination procedures must be adhered to anytime an individual leaves the transition zone.

2. Sampling Equipment Decontamination Procedures: Equipment decontamination procedure:

   - Decontamination will be performed on-site;
   - Gross contamination will be removed with a steam cleaner, brush and TSP solution.

3. Waste Disposal Procedures:

   On-Site: Discarded clothing and other articles will be containerized and stored on-site. Wet wastes from decontamination operations will be placed in 55 gallon steel drums.

   Off-Site: N/A

L. EMERGENCY PLAN

1. Emergency Personnel Responsibilities:

Name	Responsibility
L.C. ROSEN	SAFETY MANAGER
M.L. MEIERHOFF	REGIONAL OFFICE SAFETY COORDINATOR

2. Site Evacuation Procedures: Assemble immediately upon alert in the parking lot immediately south of the Steelcote office building.
3. Emergency Decontamination: Remove protective clothing and wash only if possible without jeapordizing or aggravating injury or extending time for transport to emergency facility.
4. Emergency Equipment: Industrial First Aid Kit and Transportation Vehicle
5. Emergency Communication: Normal communicaton will be verbal. If verbal is not possible, the universal hand signals will be used. In addition, three quick blasts on the truck/auto horn will be an emergency signal which will require **immediate** assembly of all personal gate for further instruction by the team leader.
6. Emergency Personnel Training Requirements: Current certification as per 29CFR 1910.120 and Basic First Aid/CPR
7. Emergency Plan: The Shannon & Wilson field operations leader, or the Health and Safety Officer will make and maintain contact with the client or his representative during any emergency which may arise on-site. The phone numbers listed in Section O of this plan will be referred to during an emergency.

   Fire 911

   Notify the Fire Department should a potential or actual fire or explosion occur, of if LEL values exceed 25 percent in the work zone.

Release of Contamination

Control or stop the spread of contamination if possible. Notify the U.S. Coast Guard Response Center then the St. Louis City Fire Department and Police of possible evacuation of the immediate area. Notify the Plant Manager, DNR, and EPA emergency response groups.

Personal Injury

Emergency first aid shall be applied on-site as necessary. Decontaminate if practicable and transport the individual to St. Louis University Hospital. An ambulance should be called immediately upon report of a major injury.

Overt Personnel Exposure

Skin Contact Immediately remove contaminated clothing and wash affected areas with soap and water. Eyes should be rinsed for at least 15 minutes upon chemical contamination. Obtain medical attention at St. Louis University Hospital.

Inhalation Move to fresh air and, if deemed necessary, decontaminate the individual and transport to St. Louis University Hospital.

Ingestion Decontaminate the individual and transport to St. Louis University Hospital. Call the hospital to inform them of the situation prior to transport, if possible.

Puncture Wound or Laceration Decontaminate and transport to St. Louis University Hospital.

4. First Aid:

BITES * Animal Bites: Thoroughly wash the wound with soap and water. Flush the area with running water and apply a sterile dressing. Immobilize affected part until the victim has been attended by a physician. See that the animal is kept alive and in quarantine. Obtain the name and address of the owner of the animal.

Insect Bites: Remove "stringer" without squeezing if present. Keep affected part below the level of the heart. Apply ice bag. For minor bites and stings apply soothing lotions such as calamine.

BURNS AND SCALDS * Minor Burns: DO NOT APPLY VASELINE OR GREASE OF ANY KIND. Apply cold water until pain subsides if there are no areas of open skin. Cover with a dry, sterile dressing. Do not break blisters or remove tissue. Seek medical attention.

Severe Burns: Do not remove adhered particles of clothing. Do not apply ice or immerse in water. Do not apply any ointments or grease. Cover burns with thick, sterile dressings. Keep burned feet or legs elevated if possible. May need to treat for shock.

Chemical Burns: Wash away the chemical soaked clothing with large amounts of water. Remove victim's chemical soaked clothing. If dry lime, brush away before flushing. Apply sterile dressing and seek medical attention.

CRAMPS * Symptoms: Cramps in muscles of abdomen and extremities. Heat exhaustion may also be present. Treatment: Same as for heat exhaustion.

CUTS * Apply pressure with sterile gauze drilling and elevate the area until bleeding stops. Apply bandage and seek medical attention.

EYES * Foreign Objects: Keep the victim from rubbing his eye. Flush the eye with water. If flushing fails to remove the object, apply a dry protective drilling to both eyes and seek medical attention.

Chemicals: Flood the eye thoroughly with water for 15 minutes. Cover the eye with a dry sterile pad and seek medical attention.

FAINTING * Keep the victim lying down. Loosen tight clothing. If victim vomits, roll him onto his side or turn his head to the side. Maintain an open airway. Bathe his face gently with cool water. Unless recovery is prompt, seek medical attention.

FRACTURES * Deformity of an injured part usually means a fracture. If a fracture is suspected, splint the part. DO NOT ATTEMPT TO MOVE THE VICTIM. Seek medical attention immediately.

FROSTBITE * Symptoms: Just before frostbite occurs, skin may be flushed, then changes to white or grayish-yellow. Pain may be felt early then may subside. Blisters may appear, affected part feels very cold and/or may be numb. Treatment: Bring victim indoors, cover the

frozen area, provide extra clothing and blankets. Rewarm frozen area quickly by immersion in warm water--NOT HOT WATER. DO NOT RUB THE PART. Seek medical attention.

HEAT EXHAUSTION * Caused by exposure to heat, either sun or indoors. Symptoms: Near normal body temperature. Skin is pale and clammy. Profuse sweating, tiredness, weakness, headache, perhaps cramps, nausea, dizziness, and possible fainting. Treatment: Keep victim in lying position and raise feet. Loosen clothing, apply cool wet cloths. If conscious, give sips of water. Seek medical attention immediately.

SUNSTROKE * Symptoms: Body temperature is high. Skin is hot, red and dry. Pulse is rapid. Victim may be unconscious. Treatment: Keep victim in lying position with head elevated. Remove clothing and repeatedly sponge the bare skin with cool water. Seek medical attention immediately.

POISONING * Call the Poison Control Center for instruction on immediate care. If victim becomes unconscious, keep the airway open. If breathing stops, begin rescue breathing. Call EMS immediately.

POISON IVY * Remove contaminated clothing. Wash all exposed areas thoroughly with soak and water. If rash is mild, apply calamine lotion or other soothing skin lotion. If a severe reaction occurs, seek medical attention.

PUNCTURE WOUNDS * If puncture wound is deeper than skin surface, seed medical attention. Serious infection can occur unless proper treatment is received.

SPRAINS * Elevate injured part and apply ice bag or cold packs. Do not soak in hot water. Immobilize affected part and seek medical attention.

UNCONSCIOUSNESS * Never attempt to give anything by mouth. Keep victim lying flat, maintain open airway. If victim is not breathing, perform rescue breathing and Call EMS immediately.

M. EMERGENCY REFERENCES
(Post on Site)

Site: STEELCOTE FACILITY Scope I.D.: _____

1. Emergency Resources:

* Ambulance 911

* Hospital Emergency Center St. Louis University Hospital

Address: Emergency Entrance at Vista and Grand Ave., St. Louis, Missouri
Phone: 314/577 8777

* Hospital Life Line 644-4600

* Hospital Poison Center 644-4600

* Local Police 911

* State Police 911

* Fire Department 911

* Explosives Disposal Unit N/A

* Radio Channel N/A

2. Emergency Contacts:

* Shannon & Wilson Consulting Physician Dr. Ross Sommer

Office: (314) 721-0666

Home: [redacted] (Emergency After Hours) Ex. 6 PII

* Regional Office Health and Safety Coordinator: M.L. Meierhoff

Office: (314) 872-8170

* Site Health and Safety Manager: L.C. Rosen

Office: (314) 872-8170

* Agency Contact USEPA (Region VII)

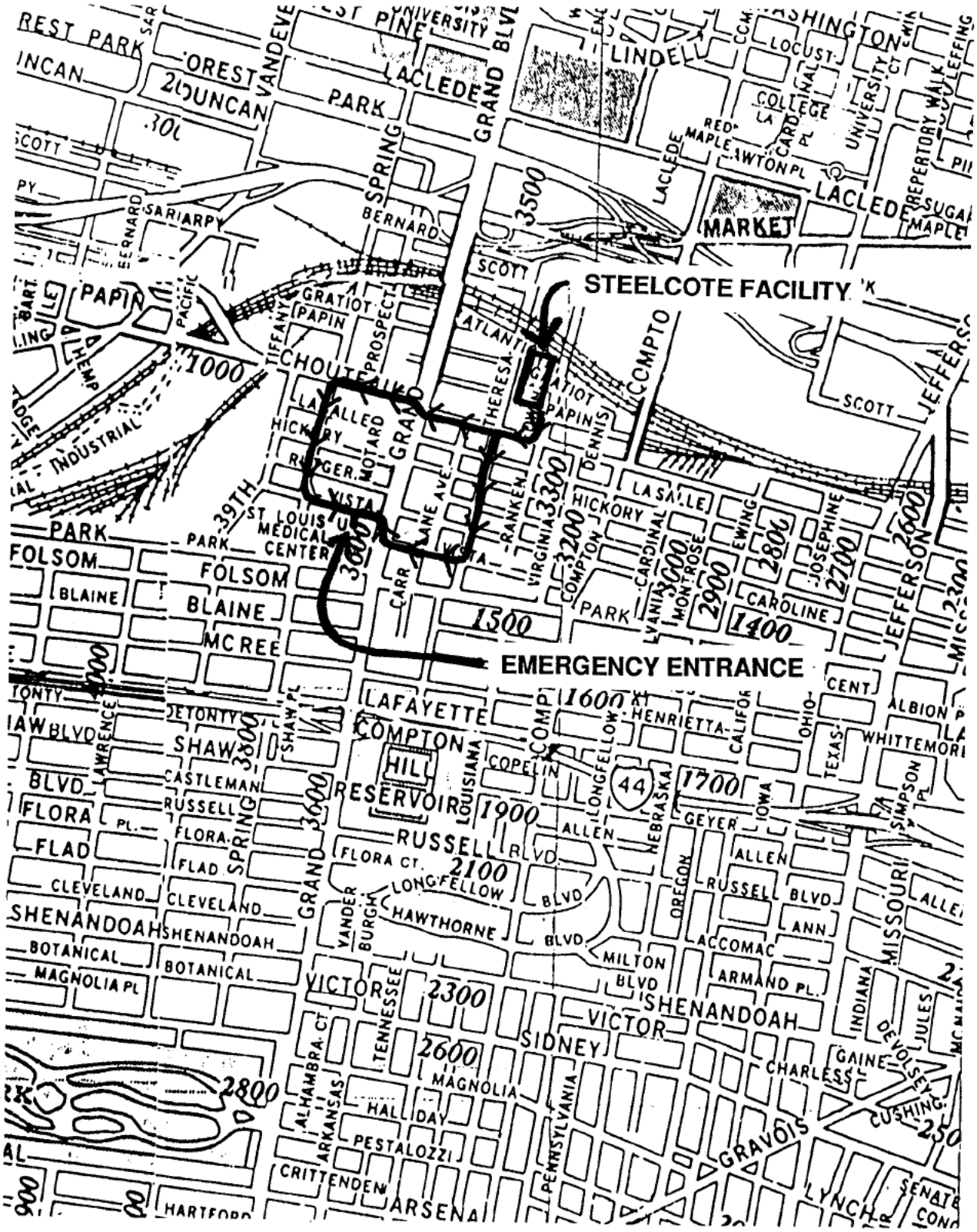
800-424-8802

* Emergency Response Team

800-424-8802

N. AREA MAP

N. AREA MAP



NORTH

ROUTE TO HOSPITAL

Z-301-01 STEELCOTE FACILITY

SHANNON & WILSON, INC.
Geotechnical Consultants

O. SITE SAFETY PLAN REVIEW

This document shall be signed by each member of the investigation team prior to the first site visit.

I have read and understand the contents of this Site Safety Plan and will comply with its provisions, requirements, and restrictions.

Site: STEELCOTE FACILITY

Location: #1 STEELCOTE SQUARE, ST. LOUIS, MISSOURI

Name (Print)	Date	Signature

P. SITE SAFETY PLAN FOLLOW-UP REPORT

1. Was the Site Safety Plan Followed?

   _____ Yes _____ No

2. If no, explain all changes to the Site Safety Plan:

   _____

   _____

   _____

   _____

   _____

   _____

3. Reason for changes:

   _____

   _____

   _____

   _____

   _____

   _____

4. Report prepared by: _____
   (Site Safety Manager)

   Date: _____

5. Report reviewed by: _____
   (Corporate Officer)

   Date: _____

Q. INCIDENT REPORT

Report Number: _____

Site: _____

Location: _____

Name of Affected Individual: _____

Address: _____

_____ Age: ____ Sex: _____ Social Sec No.: ____-__-____

Description of Incident: _____

_____

_____

Date of Incident: _____ Time of Incident: _____

Work Days Lost? ___ Yes ___ No Number of Days _____

Was Medical Care Required? _____ Yes _____ No

If Yes, Describe Care Received (attach medical record): _____

_____

_____

Date Care Received: _____ Location: _____

Name of Attending Physician: _____

Outcome of Treatment: _____

_____

_____

Future Preventive Measures/Corrective Action Taken: _____

_____

_____

_____

Report Prepared By: _____

Date: _____

Report Reviewed By: _____Date: _____

(Corporate Officer)

R. ADDENDUM TO SITE SAFETY PLAN

Use this page to add additional site data or describe any special circumstances that have become apparent after the original preparation of this Site Safety Plan. Include any changes in site conditions, PPE and monitoring modifications and other items as appropriate.

Report Prepared By: _____

Date: _____

Report Reviewed By: _____ Date: _____

(Corporate Officer)

SAFETY MEETING

Client Address: _____ Date: _____ Time: _____

Safety Topics Presented:

Protective Clothing/Equipment: _____

_____

_____

_____

Chemical Hazards: _____

_____

_____

_____

Physical Hazards: _____

_____

_____

_____

Personal Protective Equipment: _____

_____

_____

_____

Emergency Procedures: _____

_____

_____

_____

Hospital/Clinic: _____ Phone: _____

Hospital Address: _____

Review Most Direct Route to Hospital? ___ Yes ___ No

Other: _____

_____

Participants:

Name (Print) _____ Signature _____

Meeting Conducted by (Name Printed): _____

(Signature): _____